A differential contribution of Math and Language-gender stereotype to adolescents' academic performance.

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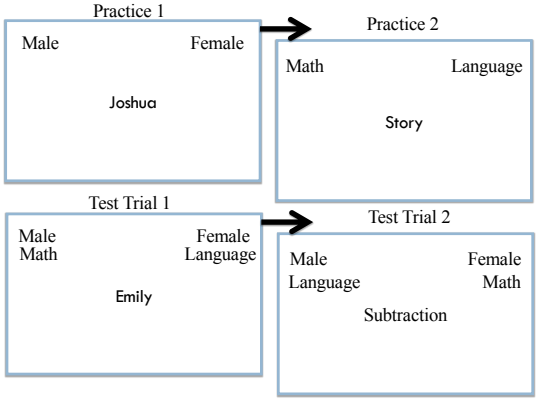
Introduction

Implicit math-gender stereotypes consist of automatic or implicit associations of math and language with particular genders. The Implicit Association Test (IAT) may be particularly useful in the context of measuring stereotyped beliefs which participants may deny, such as gender stereotypes or associations of race and crime (Kim & Greenwald, 1998).

Research has linked students' implicit gender stereotypes to gender differences in math and science achievement (Kiefer, A. K. & Sekaquaptewa, D., 2007), as well as female students' likelihood of dropping out of math-intensive majors in college (Steffens, Jelenec, & Noack, 2010). Further work has shown that these implicit attitudes may actually emerge prior to gender differences in school performance (Cvencek, Meltzoff, & Greenwald, 2011).

How the Implicit Association Test Works:

Match the target word with a category on the **right** or the **left**



The Current Study

The current exploratory investigation examined the math-language gender stereotype IAT for component IAT scores. Most applications of IAT scales are scaled to produce single composite IAT effect which may fail to disentangle the relative effects of math-male and language-female gender stereotypes. Component IAT scores were examined in order to investigate if the strength of gender association for different components of the IAT scale provides any additional information about grade 8 students' conceptual/procedural fractions knowledge. Conceptual and procedural fractions knowledge were used as a proxy for grade 8 math achievement

Method

A total of 91 Grade 8 students (50 males and 41 females) were recruited from two elementary schools in St. John's, Newfoundland. Fourteen participants were dropped from the analyses for various reasons (e.g., language barriers, learning and reading difficulties, and procedural error). The final sample contained 77 Grade 8 (41 males and 36 females, mean age = 13.69, *SD* = .30).

Gender stereotype is tested using a computer-based Math-Language gender stereotype IAT written in Python using an open source psychophysics application called Psychopy (Peirce, 2007).

Results

Table 1: *Regression Beta Coefficients of Component IAT scores and Math Self-Concept as predictors of math scores*

	Math Self-Concept β	Gender β	Math IAT β	Language IAT β	Boys IAT β	Girls IAT β	Overall IAT β	R^2
Dependent Variable								
Conceptual Math Scores	.364**	.069	-.449*	-	-.022	-.224	.413	.23
Procedural Math Scores	.531**	.265**	-.315	-	-.042	-.188	.293	.35
Combined Scores	.473**	.164	-.432*	-	-.033	-.229	.398	.31
*p<.05, **p<.01								

Table 2: *Bivariate Inter-correlations of component IAT scores (N = 77)*

	Math Words	Language Words	Boys Names	Girls Names	Composite IAT Score
Math Words	1	.321**	.268*	.274*	.685**
Language Words	-	1	.345**	.327**	.730**
Boys Names	-	-	1	.300**	.659**
Girls Names	-	-	-	1	.693**
*p<.05, **p<.01					

Figure 1. *IAT component effect sizes split by gender*

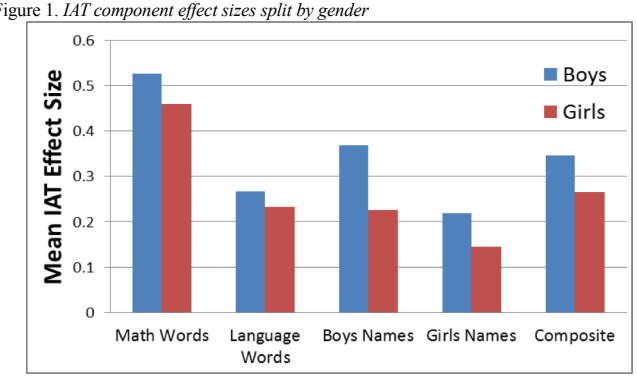


Table 3. *Partial correlations between component IAT scores and overall Math performance while controlling for overall gender bias and Math Self-Concept (n=41).*

	Math Words	Language Words	Boys Names	Girls Names	Composite IAT*
Girls only					
Conceptual Scores	-.322	.002	.349*	.026	-.058
Procedural Scores	-.175	-.010	.157	.052	-.009
Combined Scores	-.309	-.003	.320	.042	-.042
*p<.05	*Composite IAT controlling only for Math Self-Concept				

Table 4: *Partial correlations between component IAT scores and overall Math performance while controlling for overall gender bias and Math Self-Concept (n=36).*

	Math Words	Language Words	Boys Names	Girls Names	Composite IAT*
Boys only					
Conceptual Scores	-.253	.327*	-.000	-.084	-.079
Procedural Scores	-.253	.278	-.113	-.135	-.236
Combined Scores	-.270	.329*	-.045	-.110	-.164
*p<.05	*Composite IAT controlling only for Math Self-Concept				

Discussion/Future Directions

This exploratory investigation found that different IAT component scores were related to procedural and conceptual fractions knowledge for boys versus for girls. Both boys and girls had a weak negative association of math words with the male gender, such that it became the only unique contributor when male and female scores were combined.

In the future, additional participants should be tested in order to increase the sensitivity of these analyses, as only medium to large effect sizes are detectable within the current sample. An increased sample size would also enable an examination of potential mediating-moderating relationships, especially with gender. Additionally, it would be of interest to investigate the relative influence of students' math knowledge and their perseverance on tests of mathematics knowledge. Relatively few participants finished the current fractions test, and performance on tests of procedural fractions knowledge were much lower than those of conceptual math knowledge.

References

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