

Supporting On-Line Material Correlation Matrices

Boys

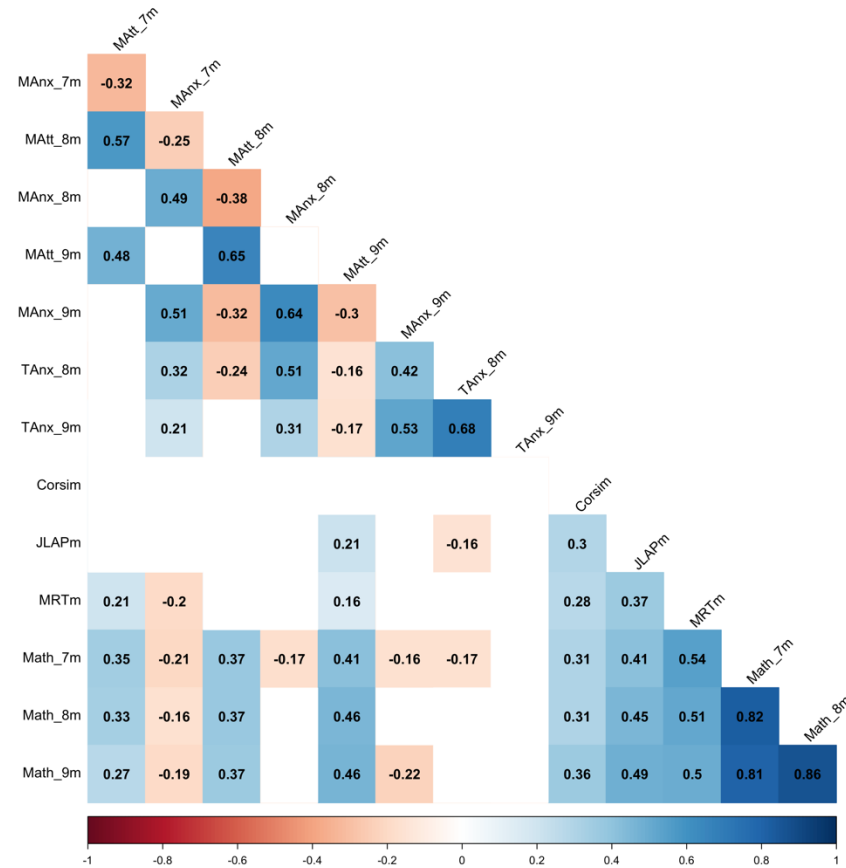


Figure 1a. MAtt = Mathematics Attitude, MAnx = Mathematics Anxiety, TAnx = Trait Anxiety, JLAP = Judgment of Line Angle and Position, MRT = Mental Rotation Test. Math = raw Numerical Operations Scores. Blanks cells are insignificant ($p > .05$).

Girls

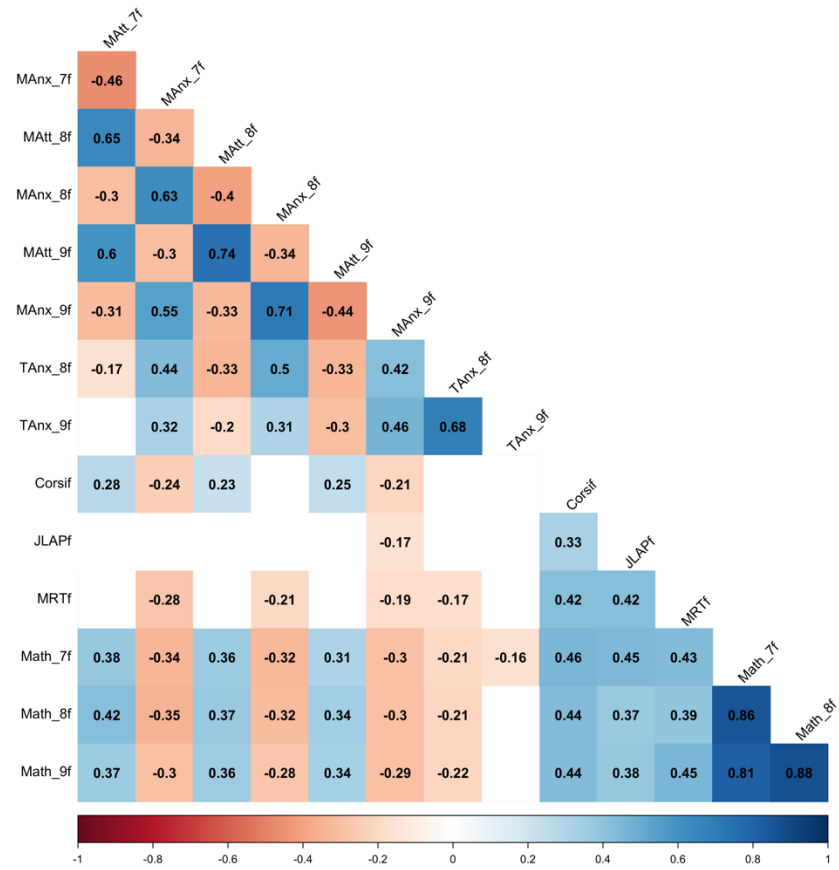


Figure 2a. . MAtt = Mathematics Attitude, MAAnx = Mathematics Anxiety, TAnx = Trait Anxiety, JLAP = Judgment of Line Angle and Position, MRT = Mental Rotation Test. Math = raw Numerical Operations Scores. Blanks cells are insignificant ($p > .05$).

Correlations Between Mathematics Achievement and Mathematics Utility Beliefs and Self-Efficacy

Boys

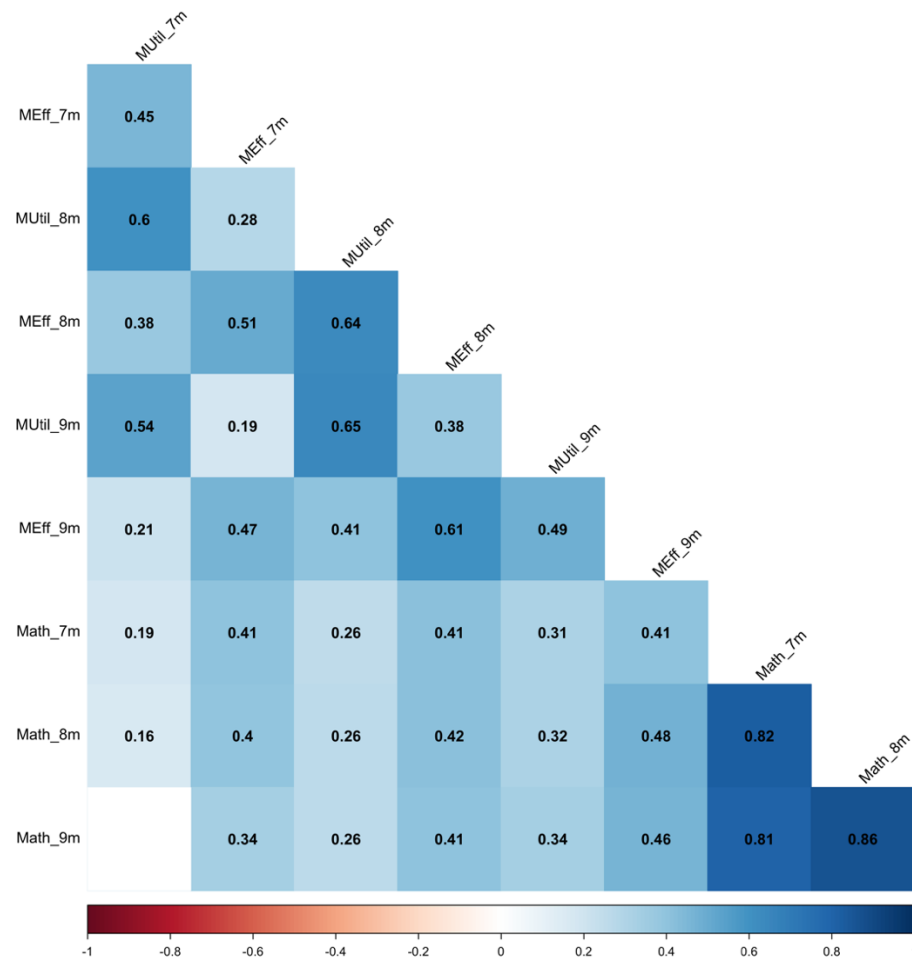


Figure 3a. MEff = Mathematics self-efficacy; MUtil = Mathematics utility; m = male. The numerals refer to grade. Blanks cells are insignificant ($p > .05$).

Girls

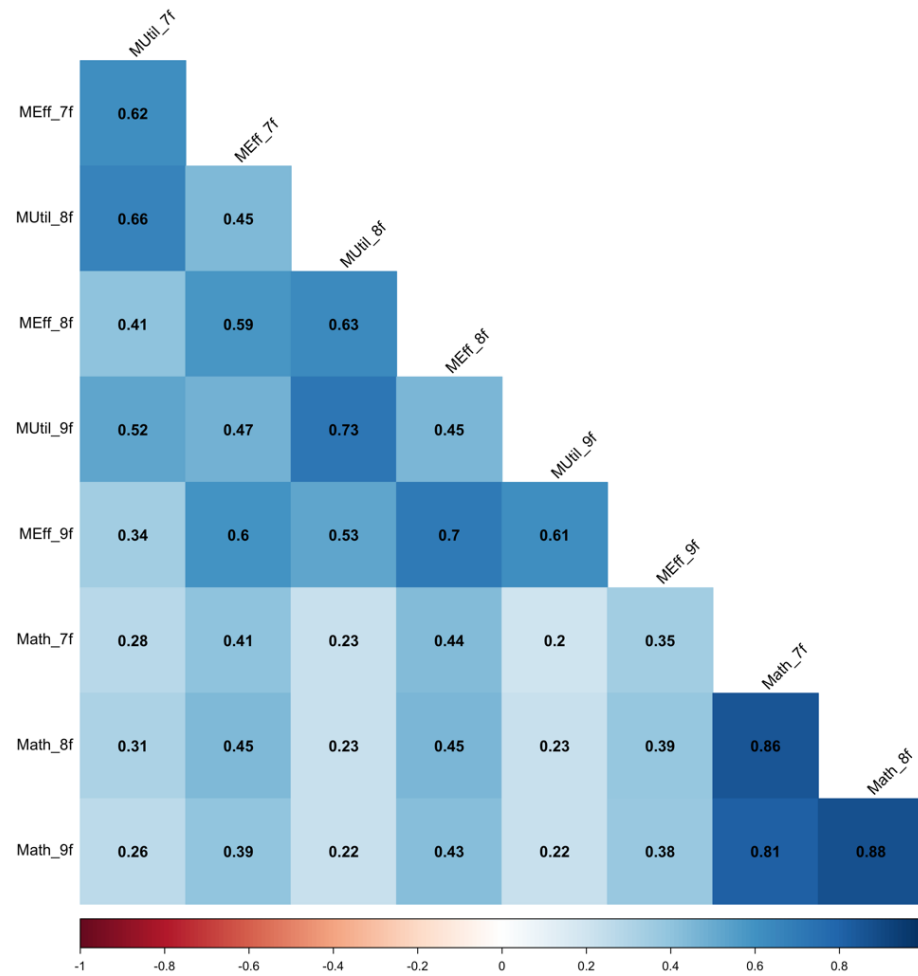


Figure 4a. MEff = Mathematics self-efficacy; MUtil = Mathematics utility; f = female. The numerals refer to grade. Blanks cells are insignificant ($p > .05$).

Mathematics Achievement Predicting Attitudes and Anxiety for Model 5

The core unstandardized and standardized coefficients for model M5, with mathematics achievement predicting attitudes and anxiety, are shown in Table 1a. Across grades, Numerical Operations scores improved, but mathematics attitudes declined, and mathematics anxiety increased ($ps < .022$). In keeping with the univariate results, boys had better spatial competencies, more positive mathematics attitudes, and lower anxiety than did girls. Inconsistent with the univariate results, girls had better initial mathematics achievement scores ($ps < .018$), but this was due to control of spatial abilities; the sex difference for the Mathematics Intercept was no longer significant when the path from Spatial was dropped ($p = .506$). There were no sex differences in developmental change (slopes) in Numerical Operations scores, mathematics attitudes, or mathematics anxiety across grades ($ps > .317$). Indeed, in restricted models examining these trajectories among girls (top section Table 2a) and boys (bottom section Table 2a) separately, the slopes for Numerical Operations, mathematics attitudes, and mathematics anxiety were significant, and all the 90% confidence intervals (CI) for unstandardized estimates overlapped for girls and boys.

For the full sample, cross-grade gains in mathematics achievement were associated with cross-grade improvement in mathematics attitudes ($p = .004$) and showed a trend for cross-grade declines in mathematics anxiety ($p = .086$). As shown in Table 5, these relations were in the same direction for boys and girls, but only significant for boys. The 90% CI did not overlap for estimates for either the mathematics slope to the attitudes slope or the mathematics slope to the anxiety slope, confirming stronger relations for boys than girls.

Table 1a

Latent Growth Curve Model (Model 5) with Achievement Predicting Attitudes and Anxiety for Full Sample

Model Component	Unstandardized Estimate (SE)	Standardized Estimate (SE)	<i>z</i>	<i>p</i>
Math Achievement Intercept	-1.57 (4.20)	-0.24 (0.63)	-0.37	.709
Math Achievement Slope	1.40 (0.18)	0.79 (0.13)	7.63	.000
Attitudes Intercept	5.03 (0.07)	6.58 (0.43)	75.65	.000
Attitudes Slope	-0.29 (0.04)	-0.86 (0.16)	-6.97	.000
Anxiety Intercept	2.34 (0.05)	3.72 (0.23)	43.53	.000
Anxiety Slope	0.07 (0.03)	0.26 (0.12)	2.30	.022
Spatial Ability → Math Intercept	6.13 (0.81)	0.79 (0.05)	7.58	.000
Sex → Spatial Ability	0.64 (0.12)	0.38 (0.06)	5.17	.000
Sex → Math Intercept	-3.42 (0.76)	-0.26 (0.06)	-4.41	.001
Sex → Math Slope	-0.26 (0.26)	-0.07 (0.07)	-1.00	.317
Sex → Attitudes Intercept	0.22 (0.09)	0.15 (0.06)	2.37	.018
Sex → Attitudes Slope	0.00 (0.05)	0.00 (0.07)	0.07	.944
Sex → Anxiety Intercept	-0.35 (0.08)	-0.28 (0.06)	-4.60	.000
Sex → Anxiety Slope	-0.00 (0.04)	-0.00 (0.07)	-0.01	.995
Math Slope → Attitudes Slope	0.05 (0.02)	0.27 (0.09)	2.84	.004
Math Slope → Anxiety Slope	-0.02 (0.01)	-0.14 (0.08)	-1.72	.086

Note. Bolded *p* values are significant at an alpha of .05. *z* and *p* values are for unstandardized estimates.

Table 2a*Latent Growth Curve Model (Model 5) with Achievement Predicting Attitudes and Anxiety by Sex*

Model Component	Unstandardized Estimate (SE)	Standardized Estimate (SE)	<i>z</i>	<i>p</i>
Girls				
Math Achievement Intercept	-3.83 (6.52)	-0.57 (0.96)	-0.59	.709
Math Achievement Slope	1.40 (0.18)	0.84 (0.18)	7.94	.000
Attitudes Intercept	5.03 (0.07)	6.30 (0.43)	71.73	.000
Attitudes Slope	-0.26 (0.05)	-0.76 (0.17)	-5.12	.000
Anxiety Intercept	2.33 (0.06)	3.80 (0.28)	41.29	.000
Anxiety Slope	0.07 (0.04)	0.31 (0.17)	1.79	.074
Spatial Ability → Math Intercept	4.91 (0.81)	0.73 (0.06)	6.07	.000
Math Slope → Attitudes Slope	0.03 (0.03)	0.14 (0.13)	0.99	.322
Math Slope → Anxiety Slope	-0.02 (0.02)	-0.16 (0.15)	-1.04	.300
Boys				
Math Achievement Intercept	-19.54 (9.34)	-2.83 (1.33)	-2.09	.036
Math Achievement Slope	1.14 (0.19)	0.96 (0.27)	5.97	.000
Attitudes Intercept	5.25 (0.06)	7.38 (0.57)	84.67	.000
Attitudes Slope	-0.46 (0.09)	-1.33 (0.25)	-5.04	.000
Anxiety Intercept	1.98 (0.05)	4.24 (0.35)	41.69	.000
Anxiety Slope	0.14 (0.05)	0.73 (0.26)	2.97	.003
Spatial Ability → Math Intercept	8.22 (1.73)	0.86 (0.06)	6.07	.000
Math Slope → Attitudes Slope	0.21 (0.07)	0.70 (0.12)	2.92	.004
Math Slope → Anxiety Slope	-0.08 (0.03)	-0.50 (0.17)	-2.36	.018

Note. Bolded *p* values are significant at an alpha of .05. *z* and *p* values are for unstandardized estimates.

Table 3a

Latent Growth Curve Model (Model 5) with Attitudes and Anxiety Predicting Mathematics for full sample

Model Component	Unstandardized Estimate (SE)	Standardized Estimate (SE)	<i>z</i>	<i>p</i>
Math Achievement Intercept	-1.56 (4.19)	-0.23 (0.63)	-0.37	.711
Math Achievement Slope	1.86 (0.25)	1.04 (0.22)	7.35	.000
Attitudes Intercept	5.03 (0.07)	6.96 (0.37)	76.13	.000
Attitudes Slope	-0.22 (0.03)	-0.79 (0.15)	-6.67	.000
Anxiety Intercept	2.33 (0.05)	4.17 (0.21)	44.75	.000
Anxiety Slope	0.04 (0.03)	0.22 (0.14)	1.69	.091
Spatial Ability → Math Intercept	6.12 (0.81)	0.79 (0.05)	7.59	.000
Sex → Spatial Ability	0.64 (0.12)	0.38 (0.06)	5.17	.000
Sex → Math Intercept	-3.42 (0.78)	-0.26 (0.06)	-4.41	.000
Sex → Math Slope	-0.24 (0.27)	-0.07 (0.07)	-0.90	.367
Sex → Attitudes Intercept	0.22 (0.09)	0.15 (0.06)	2.37	.018
Sex → Attitudes Slope	-0.01 (0.05)	-0.02 (0.08)	-0.21	.834
Sex → Anxiety Intercept	-0.35 (0.07)	-0.31 (0.06)	-4.70	.000
Sex → Anxiety Slope	0.01 (0.04)	0.01 (0.09)	0.14	.890
Attitudes Slope → Math Slope	1.86 (0.74)	0.29 (0.11)	2.53	.012
Anxiety Slope → Math Slope	-1.01 (1.06)	-0.11 (0.11)	-0.96	.337

Note. Bolded *p* values are significant at an alpha of .05. *z* and *p* values are for unstandardized estimates.

Table 4a

Latent Growth Curve Model (Model 5) with Attitudes and Anxiety Predicting Mathematics by Sex

Model Component	Unstandardized Estimate (SE)	Standardized Estimate (SE)	<i>z</i>	<i>p</i>
Girls				
Math Achievement Intercept	-5.01 (6.57)	-0.72 (.94)	-0.76	.446
Math Achievement Slope	1.52 (.23)	0.79 (.19)	6.73	.000
Attitudes Intercept	5.03 (.07)	6.19 (.52)	71.29	.000
Attitudes Slope	-0.22 (.03)	-0.62 (.14)	-6.66	.000
Anxiety Intercept	2.39 (.06)	3.27 (.27)	39.65	.000
Anxiety Slope	0.40 (.03)	0.12 (.09)	1.45	.147
Spatial Ability → Math Intercept	5.05 (.81)	0.73 (.06)	6.21	.000
Attitudes Slope → Math Slope	0.52 (.70)	0.10 (.13)	0.74	.859
Anxiety Slope → Math Slope	-0.12 (.69)	-0.02 (.12)	-0.18	.460
Boys				
Math Achievement Intercept	-18.96 (9.29)	-2.80 (1.34)	-2.04	.041
Math Achievement Slope	2.03 (.47)	1.29 (.51)	4.28	.000
Attitudes Intercept	5.25 (.06)	7.31 (.62)	84.10	.000
Attitudes Slope	-0.23 (.03)	-0.69 (.15)	-6.71	.000
Anxiety Intercept	1.98 (.05)	4.00 (.40)	40.37	.000
Anxiety Slope	0.05 (.02)	0.27 (.16)	1.99	.047
Spatial Ability → Math Intercept	8.15 (1.73)	0.86 (.07)	4.71	.000
Attitudes Slope → Math Slope	4.98 (2.54)	1.06 (.60)	1.97	.049
Anxiety Slope → Math Slope	5.45 (5.02)	0.60 (.55)	1.09	.277

Note. Bolded *p* values are significant at an alpha of .05. *z* and *p* values are for unstandardized estimates.