

Supplementary Materials 3

Results from additional exploratory analysis

Title: Math self-concept decreases while math anxiety increases over the lifespan

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Exploratory analysis of efficiency scores

To explore whether the inconsistent pattern of correlations between math self-concept, anxiety and performance is due to speed-accuracy trade-offs in the different age groups, efficiency scores were calculated to consider both reaction time and accuracy:

Efficiency score = Median reaction time / Percentage of correct answers

Efficiency scores are a composite measure used to assess overall task performance by accounting for both speed and accuracy. A higher efficiency score indicates lower overall efficiency and task performance (longer reaction times and/or lower accuracy). Conversely, a lower efficiency score reflects better task performance (faster and/or more accurate responses).

To explore whether math self-concept and math anxiety are correlated with efficiency scores within or across age groups, Bayesian correlations were evaluated for each age group and across groups. Results showed conclusive evidence only for the correlation between math self-concept and efficiency score in younger adults (see Table S18), indicating that higher math self-concept is related to better task performance in younger adults.

Table S18. Correlations of efficiency scores within and across age groups

	children	younger adolescents	older adolescents	younger adults	middle- aged adults	older adults	overall
math self- concept	.013	-.166	-.308	-.436**	-.235	-.149	-.031
math anxiety	-.082	.086	-.001	.227	.037	.207	-.063

Notes. * $BF_{10} > 3$, ** $BF_{10} > 30$, *** $BF_{10} > 100$

Exploratory analysis for different levels of math self-concept and math anxiety

To further investigate the developmental changes in math self-concept and math anxiety across the lifespan, we categorized both variables into three levels based on the whole sample: low ($-1\ SD$), average, and high ($+1\ SD$). This categorization allowed us to examine whether the linear age-related trends differ across different levels of math self-concept and math anxiety, by accounting for individual differences across age groups. We conducted Bayesian regressions on math self-concept and math anxiety by considering age group and math self-concept/anxiety levels, and their interaction.

Math self-concept

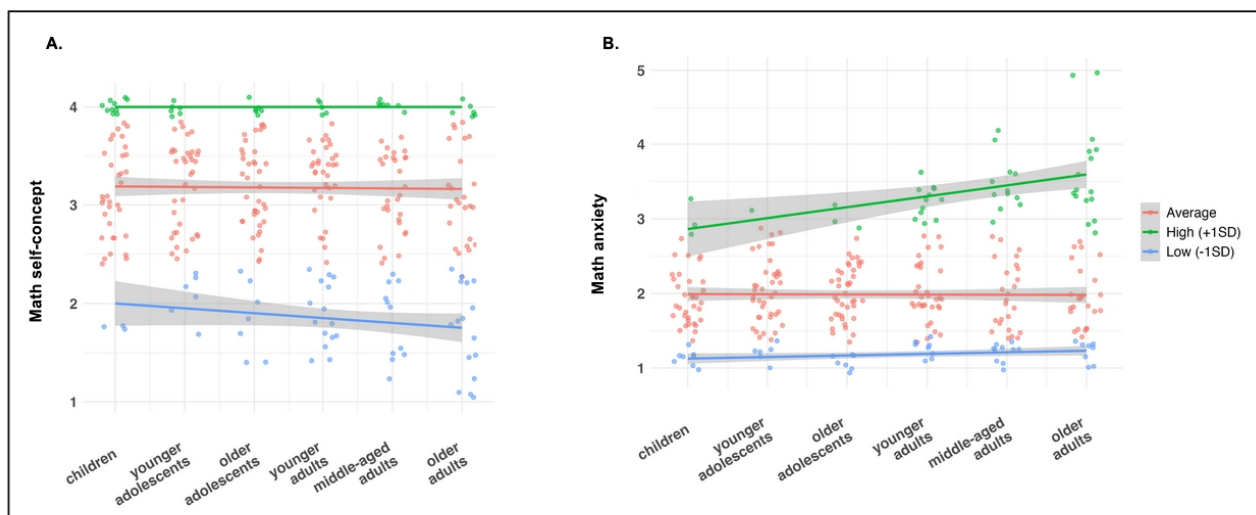
The exploratory analysis on math self-concept revealed inconclusive evidence for age group ($\beta = -0.01$, 95% CI $[-0.06, 0.04]$) and for the interaction between age and math self-concept levels, as neither the high ($+1\ SD$) group ($\beta = 0.00$, 95% CI $[-0.07, 0.08]$) nor the low ($-1\ SD$) group ($\beta = -0.04$, 95% CI $[-0.11, 0.04]$) showed significant changes over time. This suggests that the relationship between math self-concept and age remains relatively stable across different self-concept levels, with no clear evidence that age moderates this association.

Math anxiety

The exploratory analysis on math anxiety showed inconclusive evidence for age ($\beta = -0.00$, 95% CI $[-0.04, 0.04]$), but conclusive evidence for the interaction between age and high math anxiety ($\beta = 0.15$, 95% CI $[0.07, 0.23]$), indicating that individuals with high anxiety exhibited even higher levels of math anxiety in older than younger individuals. This suggests that math anxiety levels of highly anxious individuals are more pronounced with increasing age, potentially due to cumulative negative experiences or avoidance behaviors in mathematical contexts. Conversely, there was inconclusive evidence for the interaction between age and low anxiety ($\beta = 0.02$, 95% CI $[-0.05, 0.09]$).

These findings suggest that the age-related trajectories of math self-concept and math anxiety are not consistent for different levels (see Figure S6): Math anxiety, particularly for highly math-anxious individuals, is more pronounced with aging. While the descriptive pattern is similar for math self-concept, evidence rather revealed that it remains relatively stable over time.

Figure S6. Different levels of math self-concept and math anxiety across the lifespan



Exploratory analysis with attenuation correction for reliability of math anxiety

S19. Corrected Bayesian Correlation between Math anxiety and reaction time

	children	younger adolescents	older adolescents	younger adults	middle- aged adults	older adults	overall
math self-concept & math anxiety	-0.813 **	-0.573 *	-0.760 ***	-0.796 ***	-0.791 ***	-0.826 ***	-0.786 ***
math self-concept & reaction time	0.210	-0.136	-0.200	-0.466 **	-0.253	-0.251	-0.025
math self-concept & error rate	-0.305	-0.180	-0.523 **	-0.085	-0.126	-0.124	-0.088
math anxiety & reaction time	-0.163	0.201	-0.077	0.280	0.019	0.381 *	-0.028
math anxiety & error rate	0.311	-0.066	0.160	0.101	0.094	0.100	-0.014
math self-concept & complexity effect (RT)	0.235	-0.015	-0.016	-0.382 *	-0.230	-0.047	-0.088
math self-concept & complexity effect (ER)	0.046	-0.294	-0.025	-0.371 *	-0.363	-0.184	-0.191
math anxiety & complexity effect (RT)	-0.191	0.287	-0.266	0.339	0.065	0.115	-0.051
math anxiety & complexity effect (ER)	0.040	-0.008	-0.154	0.402 *	0.240	0.056	0.091