# S2. Supplementary Materials

*Non-numerical stimulus controls*

Two sets of numerical stimuli were created for each numerical value used in the non-symbolic training problems. One set of numerical arrays was equated on intensive parameters (individual item size and average inter-item spacing) across all numbers used and varied on the extensive parameters (total occupied area and total luminance). The other set was equated, on average, by number in the extensive parameters, but varied in the intensive parameters by number. For each numerical value in each set, 5 different numerical arrays were produced that varied in position and spacing of individual dots on the screen. Such controls have been employed in other studies of numerical cognition (Hyde & Spelke, 2009, 2011; Hyde & Wood, 2011; Izard et al., 2008; Piazza et al., 2004, 2007). For each numerical array needed in the numerical training programs (addend 1, addend 2, and foil array for the non-symbolic approximate addition condition; array 1 and comparison array for numerical comparison condition), the program randomly chose either the set equated on extensive parameters or the set equated on intensive parameters. Furthermore, the program randomly chose 1 of the 5 images produced for each numerical value. Thus, there was no systematic relationship between images chosen in the set, for each component of each trial, and each trial was very likely a different combination of images for each subject in the study.

*Gameplay for non-symbolic training conditions*

The training tasks were presented in the context of a game where either a good cartoon character surreptitiously added more dots (or made the display lighter, or made the line segment taller) or a bad cartoon character surreptitiously stole items (or made the display darker or made the line segment shorter) from behind the occluder, resulting in a final set with more or less numerous (or bright or tall) than the expected outcome.

*Lack of a response time limit in non-symbolic numerical addition condition only.*

As outlined in Figure 1, non-symbolic numerical addition did not impose a 5000 millisecond response time limit like the other three conditions. The lack of a response time limit for the final stimulus in the addition condition was, in fact, an error in the code found after the experiments had been ran. It went unnoticed in the running of the experiments because children overwhelmingly responded quicker than 5 seconds in all conditions (including the addition condition). In fact, an examination of the mean reaction time for all conditions was well below 3000 msec. Furthermore, the same principles were applied to the analysis of all conditions (all response times over 5 seconds in any condition were thrown out and counted as incorrect). In the end, it appears that this timing difference made no theoretical difference, as the numerical comparison condition, with the 5-second stimulus presentation limit, produced comparable enhancements in subsequent symbolic math performance to that of children in the addition condition without the 5-second limit.

*Equating children for extent of elementary school experience*

Initial testing of the brightness and numerical addition conditions of Experiment 1 was conducted between February and May of year 1 of testing. The line length addition and number comparison tasks were followed up from February to June of year 2. As such, all children in Experiment 1 were in the second the half of the same elementary school grade when tested.

*Missing data for Experiment 1.* The following numbers of children completed all four test sets: numerical addition = 19, brightness comparison = 19, line addition = 17, and numerical comparison = 16. The following numbers of children completed three out of four test sets: numerical addition = 3, brightness comparison = 3, line addition = 5, and numerical comparison = 5. The following numbers of children completed two out of four test sets: numerical addition = 2, brightness comparison = 2, line addition = 2, and numerical comparison = 1. The following numbers of children completed only one out of four test sets: numerical addition = 0, brightness comparison = 0, line addition = 1, and numerical comparison = 1.

*Details for accuracy scoring procedure for sentence completion problems*
Here we outline the scoring procedure for sentence completion problems. The original experimenter (E1) did a first pass scoring of the sentence completion problems, marking those questions with the intended answer as correct and those without the intended answer as incorrect. However, some children provided misspellings of the intended answer or other words that started with the same letter as the intended correct answer, including some alternatives that were reasonably acceptable within the context of the sentence. To decide whether or not to count these alternatives (either incorrectly spelled words or potentially acceptable alternatives) correct, an additional research assistant (R1) went through all sentence completion answers and noted any potential answers that were either not spelled correctly but could be correct or were a completely different word with the same first letter. These items were then blinded from condition by R1 and recoded by two blind coders (R2 and R3). The few discrepancies that arose between the blind coding of R2 and R3 were discussed and resolved by the blind coders.

*Effects of Test Order in Experiment 2*
Test Order: $F(1, 44) = .474$, $p = .495$, $\eta_p^2 = .011$; Test Order X Training Condition: $F(1, 44) = .741$, $p = .394$, $\eta_p^2 = .017$; Test Order X Test Type: $F(1, 44) = .736$, $p = .396$, $\eta_p^2 = .016$; Test Order X Training Condition X Test Type: $F(1, 44) = .219$, $p = .642$, $\eta_p^2 = .005$.

## S2. References

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