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Supplementary Information for

Context shapes early diversity in abstract thought

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Supplementary Information

Experiment 1

Detailed procedure. After a quick warm-up with the experimenter, the child was introduced to the novel toy. The experimenter began by placing a box on the table, saying "This is my toy! Sometimes when I put things on top, my toy will play music, and sometimes when I put things on top, my toy does not play music. Watch! Let's see how it works!" The experimenter then produced two blocks in either the *same* or *different* relation (depending upon the condition) and said "Let's try!", putting both blocks on top of the toy simultaneously. The toy played music and the experimenter said, "Music! My toy played music!" The experimenter then picked up the blocks and set them back on the toy, which again played music, saying "Music! These ones made my toy play music!" She then repeated this procedure with a new pair of blocks in the opposite relation. The new pair did not make the toy play music, and the experimenter responded to the first try with, "No music!" and after the second try, said "No music. These ones did not make my toy play music." This pattern was repeated with two additional pairs of blocks, one in each relation. The experimenter always began with a causal pair (identical blocks in the *same* condition and blocks of unique colors and shapes in the *different* condition), and then alternated inert, causal, inert, using novel blocks in each new pair, and randomizing the specific blocks between participants.

After the four training trials, the experimenter said "Now that you've seen how my toy works, I need your help finding the things that will make it play music. I have two choices for you." The experimenter presented the child with two new pairs composed of novel blocks, one "same" pair and one "different" pair. Each pair was presented on a tray, which the experimenter held up, saying, "I have these…and I have these [directing the child's attention to each pair, in turn]. Only one of these trays has things that will make my toy play music. Can you point to the tray that has the things that will make it play?" The trays were then placed on either side of the toy, just out of reach of the child, with the order and side of presentation of the correct pair counterbalanced between participants. The experimenter recorded the child's first point or reach, scoring the response as correct (1) if the child chose the test pair (*same* or *different*) that corresponded to her training, and incorrect (0) for the opposite pair.

Experiment 2

Additional results and discussion. In addition to the regression analysis reported in the main text of Experiment 2, we also ran a series of binomial tests to assess performance by condition and age group separately, and find comparable evidence for distinct trajectories in relational reasoning. That is, in the U.S., 36-48-month-olds months fail to select the correct relation at test in either condition (Exp.1, *same*: 20/38 correct, *different*: 15/38 correct, *p*s > .1, two-tailed binomials), 18-30-month-olds succeed (two-tailed binomial, *same*: 18/23 correct, p=.01; *different*: 17/22 correct, p=.02), and 30-36-month-olds fall in between (*same*: 14/20 correct, p=.06; *different*: 10/20 correct, p>.1). In contrast, children in China maintain or *improve* their performance during the 18-36 month window. At 18-30 months, Chinese children correctly select the relational test pair in the *same* condition (15/20 correct; two-tailed binomial, p = .04), but fail to do so in the *different* condition (11/20 correct; p > .1). Then, at 30-36 months, they correctly infer and apply both relational concepts (*same*: 16/20 correct, p = .01; *different*: 15/20 correct, p = .04), with no difference in performance observed between 30-36 months and 3 years of age (Exp. 1), (two-tailed p > .1, Fisher's exact; see Fig. S1), indicating stable understanding.

Given early success in both *same* and *different* conditions in the U.S., we replicated the *different* condition with an additional sample of 18-30-month-olds in China (N=20, *mean age*=23.9 mos., 10 girls). Again, performance did not differ from chance, (11/20 correct; two-

tailed binomial $p > .05$), with no significant difference between the two samples collected ($p = 1$). This asymmetric performance is consistent with recent results using an anticipatory-looking paradigm with 7-, 12-, and 14-month-old infants in the U.S., suggesting that the "same" relation may be acquired before representations of "different" (*1-2*). That is, below-ceiling performance in the causal relational reasoning task appears to be coupled with an advantage for the "same" relation in both the U.S. (*3*) and China. These findings suggest that the advantage for reasoning in the "same" condition seen in the U.S. may extend across cultural contexts. This is a possibility that should be explored further in future work.

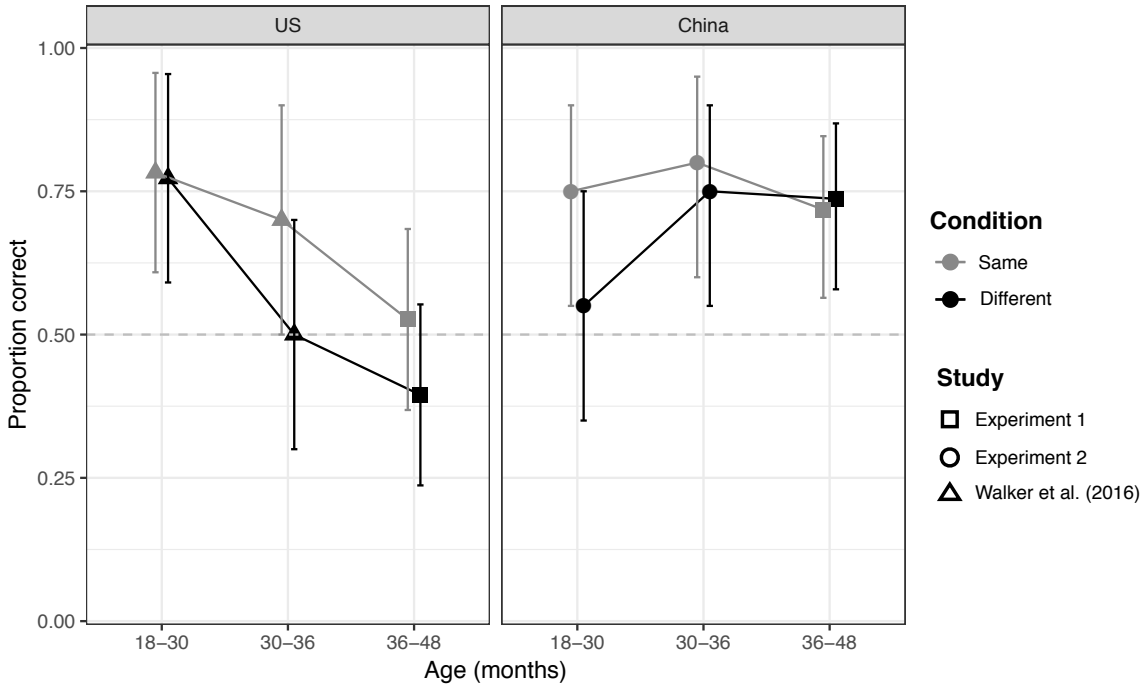

Fig. S1. Proportion of correct relational matches selected by toddlers and preschoolers in the U.S. and China. For comparison purposes, U.S. toddler data (18-30 and 30-36 months) is reproduced from Walker et al. (*3*, Exp. 1) and indicated with triangle markers. Preschooler data (36-48 months) from Experiment 1 is indicated with square markers. Error bars indicate 95% confidence intervals, and the dotted line represents chance performance.

References

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