



Double Dissociation: Integrating Color/Shape aids Conditional Discrimination but Separating them aids Card Sorting in 3-year-olds

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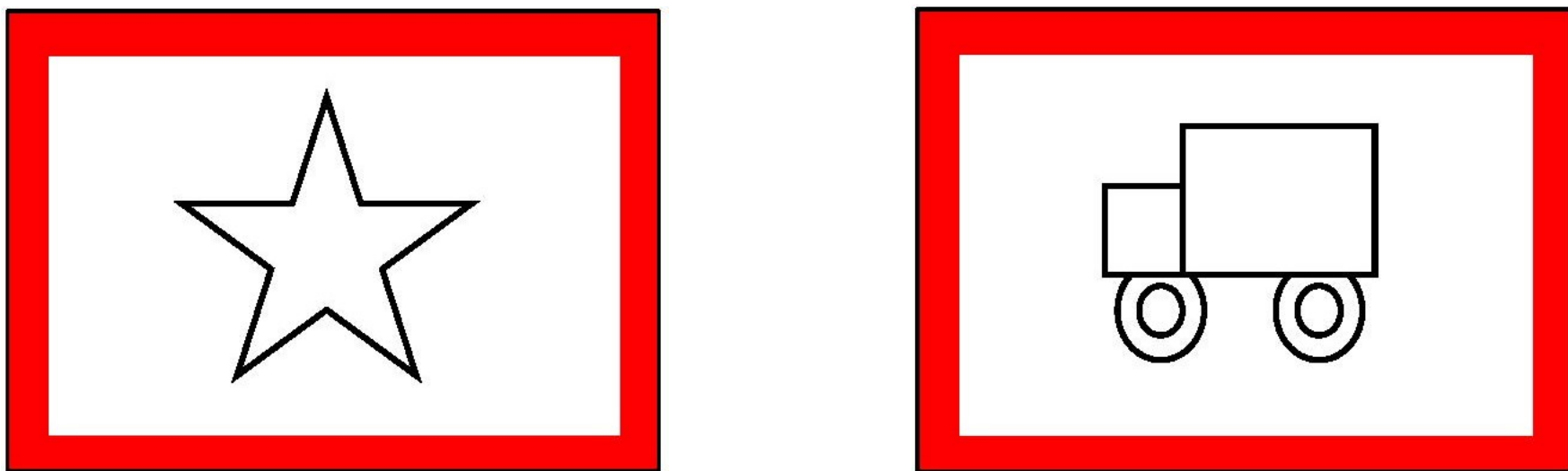
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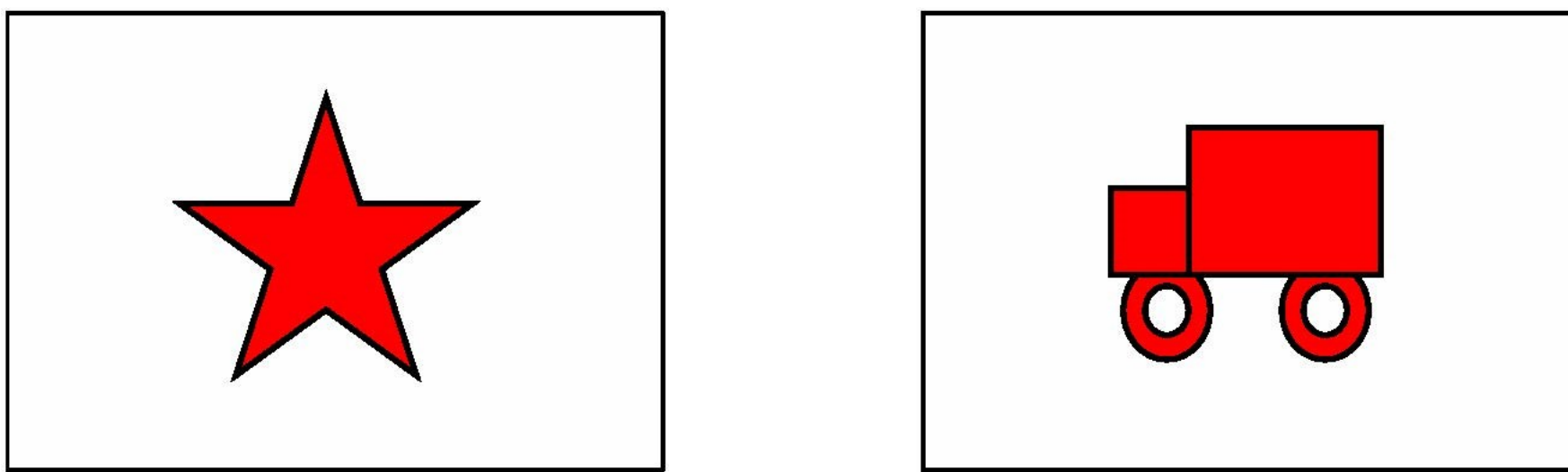
SUMMARY

We report here success on Conditional Discrimination (CD) in children younger than ever reported before (age 3 years). We did that by **integrating** color into the stimulus object.

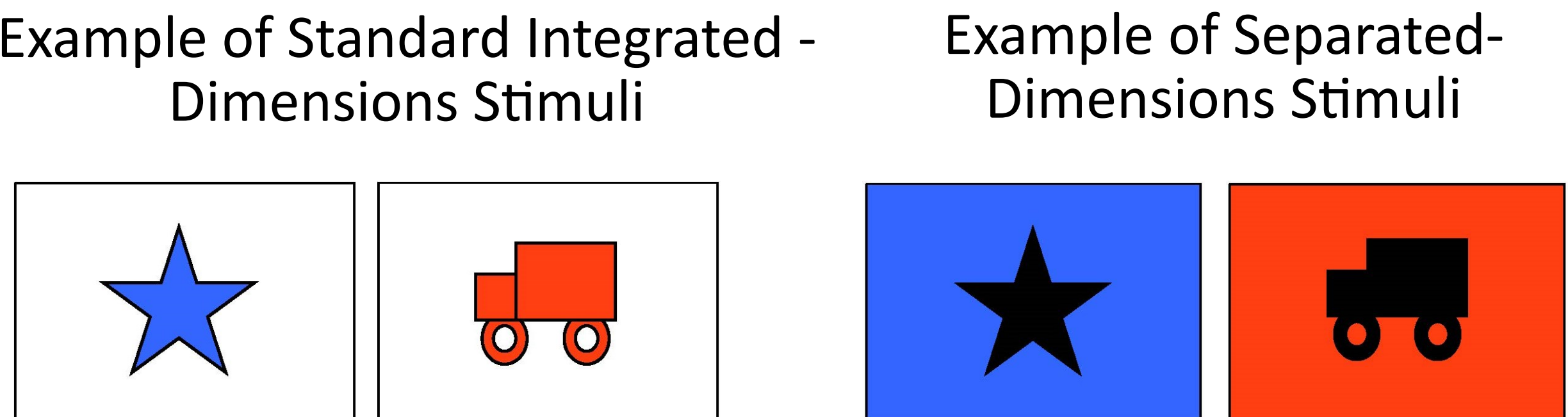
Standard Conditional Discrimination Stimuli:



Example of our Integrated Dimensions Stimuli:



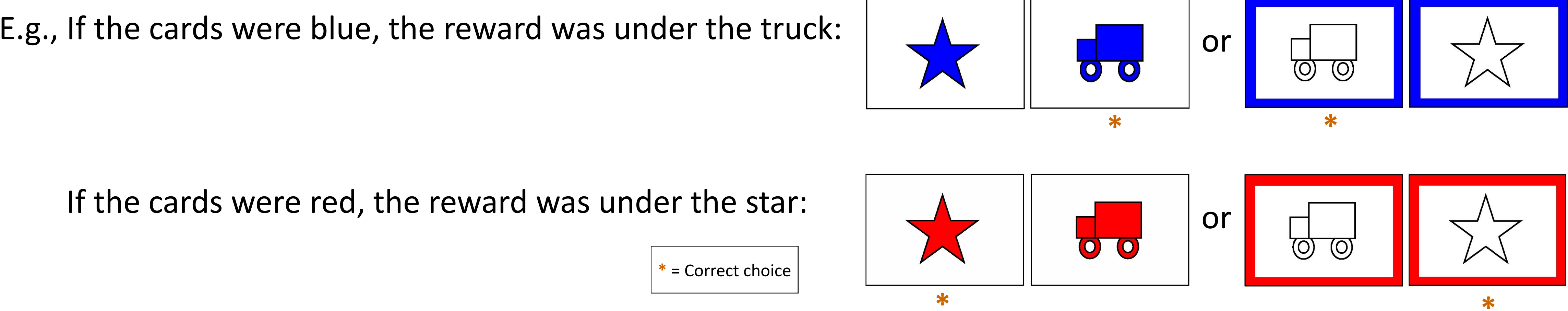
We also report a double dissociation. We previously demonstrated success on the Dimensional Change Card Sort (DCCS) task in children younger than ever reported before (age 3 years) by **separating** color and shape (instead of a stimulus being red or blue, the stimuli were black, but the background was red or blue; Diamond, Carlson, & Beck, 2005; see also Kloo & Perner, 2005).



Integrated Stimulus Dimensions	Conditional Discrimination	DCCS
	DCCS	Conditional Discrimination
Separated Stimulus Dimensions		

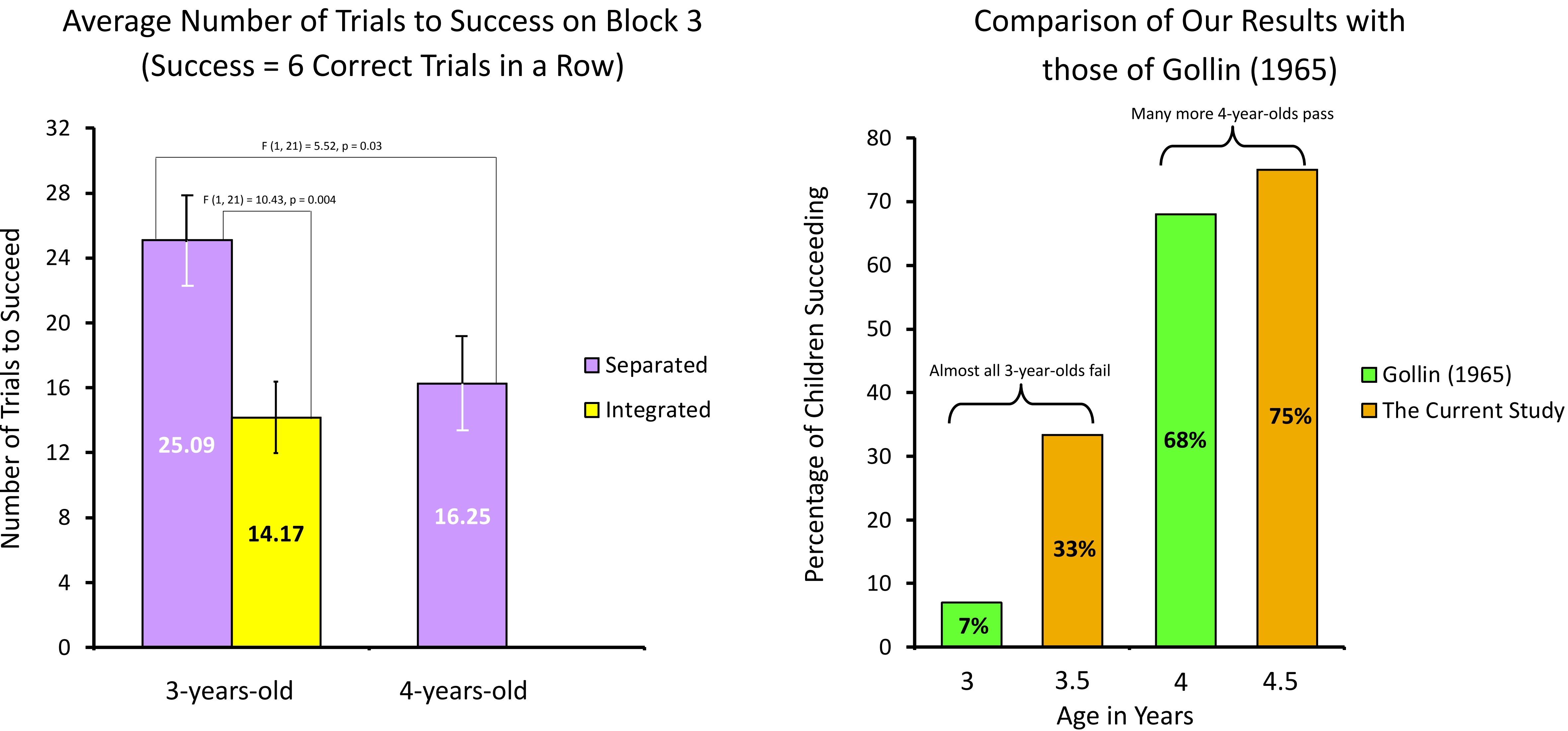
PROCEDURE

Out of sight of the child, a marble was hidden in one of two boxes. The child was presented with the two boxes, each covered by a stimulus card. Both cards were blue or both were red. One showed a truck and the other a star. The child’s task was to deduce the rule that determined where to find the marble reward:



After finding the marble, the child could place it in a slide, much to the child’s delight. ☺
In Block 1, the child was presented with all Blue Cards. In Block 2, the child was presented with all Red Cards. In Block 3, trials with two Blue Cards or two Red Cards were randomly intermixed.
For Blocks 1 and 2, a child could succeed without necessarily paying attention to color.
On Block 3, the only way a child could succeed was by having deduced the conditional rules: “If blue, choose truck. If red, choose star.”

RESULTS



TAKE-HOME MESSAGE

75% of 3-year-olds succeeded on Conditional Discrimination when the dimensions (color and shape) were integrated. 3-year-olds performed significantly better on Conditional Discrimination with integrated dimensions than with separated ones.
Performance of 3-year-olds on Conditional Discrimination with integrated dimensions was comparable to that of 4-year-olds with separated dimensions.

DISCUSSION

We found that 3-year-olds (12 months younger than ever previously reported) can succeed on Conditional Discrimination when color and shape are integrated.
We had shown earlier that on DCCS, when color and shape are separated, children can succeed 12 months younger than previously reported (Diamond et al., 2005).
We predicted this double dissociation because in Conditional Discrimination, one needs to mentally integrate the dimensions and use color to inform which shape is correct. For Dimensional Change Card Sort, however, one should focus on only color or only shape, ignoring the others, so it helps if the dimensions are separated on the stimulus cards.

REFERENCES

Diamond, A., Carlson, S. M., & Beck, D. M. (2005). Preschool children's performance in task switching on the dimensional change card sort task: Separating the dimensions aids the ability to switch. *Developmental Neuropsychology*, 28, 689-729.
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Zelazo, P. D., Frye, D., & Rapus, T. (1996). An age-related dissociation between knowing rules and using them. *Cognitive Development*, 11, 37-63.