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Cognitive Development



Do children need reminders on the day–night task, or simply some way to prevent them from responding too quickly?



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ABSTRACT

We previously reported better performance on the day–night task when a ditty was chanted between stimulus presentation and when children could respond (Diamond, Kirkham, & Amso, 2002). Here we investigated competing hypotheses about why the ditty helps. Does it help because it imposes a brief waiting time (the child waits while the ditty is chanted before responding)? Or, does the ditty help because of its content, providing information helpful to performing the task? One-third of the 72 children (age 4) were tested with the ditty previously used which reminds them: “Think about the answer; don’t tell me”. Another 24 children were tested with a ditty with no task-relevant content: “I hope you have a nice time; I like you”. One-third received the standard condition. Performance in both ditty conditions was comparable and better than in the standard condition. That indicates that a factor common to both ditties (that chanting them took time, allowing the prepotent response to subside and the more-considered answer to reach response threshold) likely accounts for their benefit. Whether a ditty reminded children what to do or not did not affect the results. The challenge of the day–night task for preschoolers is not its working memory demands but the need to inhibit a dominant response, making a different response instead.

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1. Introduction

Children of 3–5 years err on the day–night stroop-like task, which requires that they say the opposite of what the stimulus cards represent (saying “day” when shown a black card with a moon and stars and saying “night” when shown a white card with a sun (Gerstadt, Hong, & Diamond, 1994; review: Montgomery & Koeltzow, 2010).

Why young children have difficulty with the task has been hotly debated. One hypothesis is that young children are too impulsive to take the time they need to inhibit their prepotent response (Diamond, Kirkham, & Amso, 2002; Gerstadt et al., 1994; McAuley, Christ, & White, 2011; Montgomery & Fosco, 2012; Simpson & Riggs, 2005). Another hypothesis is that young children have difficulty holding the rules for the task in mind with sufficient clarity over the 16 test trials (Munakata, 2013).

Diamond et al. (2002) reasoned that if young children need time to successfully inhibit their prepotent response and compute the correct answer, then giving children more time with the stimulus visible before they can respond should aid their performance. In one condition, after turning over a stimulus card, the tester chanted a little ditty before the child responded. Four-year-olds were correct on almost 90% of the trials (89% correct), whereas in the standard condition four-

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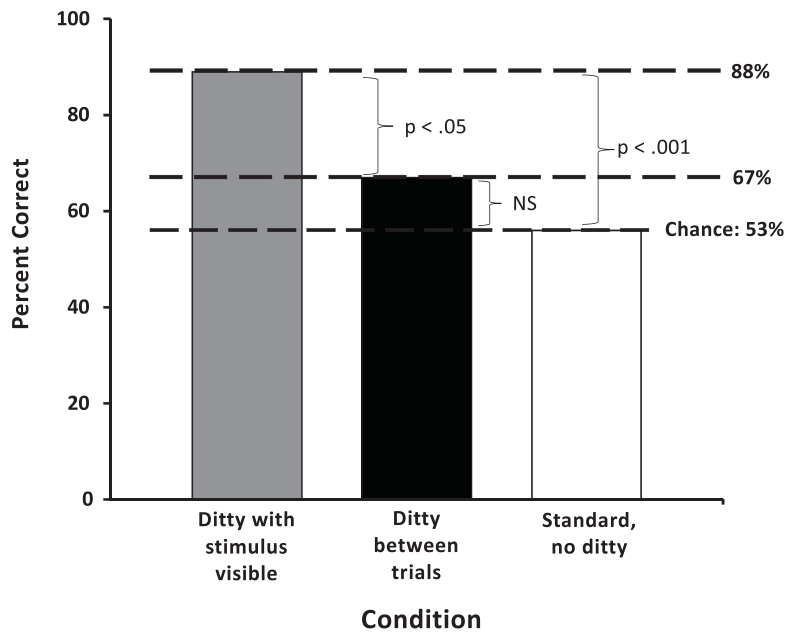


Fig. 1. Results from the ditty and standard conditions of Diamond et al. (2002).

year-olds performed at chance (56% correct). When the same ditty was chanted between trials (before the stimulus was revealed) it did not significantly aid performance. See Fig. 1.

Munakata (2013) has offered a different interpretation for why the ditty helped. The words of the ditty were, “Think about the answer; don’t tell me”. Telling children to think about the answer could be considered task-relevant information instructing them to think before answering. Munakata hypothesized that the content of the ditty was responsible for the ditty’s beneficial effect. Although chanting the ditty between trials did not significantly improve performance (Diamond et al., 2002), there was a slight trend for performance to be better there than in the standard condition (see Fig. 1) consistent with Munakata’s hypothesis.

Here, we put these two competing interpretations (a ditty helps because it allows time for the prepotent response to subside, making it easier to inhibit that response and give the correct response instead – or – a ditty helps because it aids memory by reminding the child of task-relevant information) to the test. We did that by having two conditions with different ditties, one using a ditty without task-relevant information, “I hope you have a nice time; I like you” and one with task-relevant information (the original ditty used previously: “Think about the answer; don’t tell me”). If children *only* benefit, or benefit more, from the task-relevant ditty, then the content of the ditty accounts for all, or at least part, of the beneficial effect of chanting the ditty. If both ditties aid performance comparably (the one without task-relevant information and the one with) then it would seem that the entire beneficial effect of a ditty is due simply to it taking time to chant it and children waiting until the chanting is over before responding (i.e., it provides a way to get children to wait a few seconds before responding).

2. Method

2.1. Participants

Seventy-two children (33 girls and 39 boys) were tested. Their mean age was 4.4 years (0.4 years SD; range was 45.0–59.5 months). All children could understand and converse in English, had normal or normal-with-correction hearing and sight. None were taking any medication that affects cognition; none had suffered a concussion or lost consciousness from a fall or blunt trauma to the head. The children came from all over the greater Vancouver area. Most were of East Asian (42%) or European (30%) origin; 10% were of South Asian origin, 5% were Hispanic, and 13% were of mixed or other ethnicity. Most of the children were tested in StrongStart Centres (81%); the rest were tested at our lab (Standard: 21%; Task-relevant-ditty: 21%; Task-irrelevant ditty: 17%). Each child was accompanied by a parent or caregiver who either sat behind the child during testing or watched through the lab’s one-way mirror. A subset of sessions (10%) was videotaped with permission from the parent/caregiver.

Of the 72 children, one-third (24 children; 50% female) were tested on the standard condition (no ditty), one-third (42% female) with the old, task-relevant ditty (“Think about the answer; don’t tell me”), and one-third (46% female) with the new,

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