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How Adults' Actions, Outcomes, and Testimony Affect Preschoolers' Persistence

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Across four experiments, we looked at how 4- and 5-year-olds' (n = 520) task persistence was affected by observations of adult actions (high or low effort), outcomes (success or failure), and testimony (setting expectations—"This will be hard," pep talks—"You can do this," value statements—"Trying hard is important," and baseline). Across experiments, outcomes had the biggest impact: preschoolers consistently tried harder after seeing the adult succeed than fail. Additionally, adult effort affected children's persistence, but only when the adult succeeded. Finally, children's persistence was highest when the adult both succeeded and practiced what she preached: exerting effort while testifying to its value.

Children's persistence in the face of challenge is key to academic success (Duckworth & Seligman, 2005; Eskreis-Winkler, Shulman, Beal, & Duckworth, 2014). Even the way children think about the relationship between effort and outcomes causally impacts academic achievement: children who believe effort leads to changes in ability outperform those who think ability is a fixed trait (Blackwell, Trzesniewski, & Dweck, 2007). Motivation before children enter formal schooling is particularly important, as early patterns of persistence set children on a positive trajectory for future cognitive and academic achievement (Messer et al., 1986; Mokrova, O'Brien, Calkins, Leerkes, & Marcovitch, 2013; Yarrow et al., 1983). Thus, parents and educators alike are interested in finding ways to boost persistence in young children (Smith, 2014; Tough, 2016).

We know children's own past experiences of success and failure impact their persistence. Preschoolers are much more likely to indicate that they are "not good" at solving puzzles after experiencing failure than at baseline (Smiley & Dweck, 1994), and more likely to imitate an adults' means of achieving a goal if they have failed in their own attempts first (Williamson, Meltzoff, & Markman, 2008). However, children's persistence is also affected by the adults around them.

One way adults can impact children's effort is through their words. Indeed, adult praise for effort, rather than ability, encourages children to persist on challenging tasks (Mueller & Dweck, 1998) and early praise for effort correlates with children's beliefs about the relationship between effort and outcome years later (Gunderson et al., 2013). Subtle linguistic cues can also impact children's moment-to-moment motivation: children who are asked to "be a helper," a generic phrase that invokes inherent identity, are more likely to help than those simply asked "to help" (Bryan, Master, & Walton, 2014). Similarly, children are less likely to cheat when told, "please don't be a cheater" versus "please don't cheat" (Bryan, Adams, & Monin, 2013). At the same time this form of generic language, which implies that abilities are stable traits, can be demoralizing in the face of failure. Children who were told that they were "good drawers" were less resilient following mistakes on a drawing task than children who were told that they "did a good job drawing" (Cimpian, Arce, Markman, & Dweck, 2007). Thus, subtle changes in how we speak to children can dramatically impact their motivation.

However, what adults do may matter as much or more than what they say. Children are adept at

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learning from and reproducing adults' modeled actions. They faithfully imitate elaborate actions that, although causally unnecessary, may be relevant to norms, conventions, or broader social practices (Harris, 2012; Kenward, Karlsson, & Persson, 2011; Lyons, Young, & Keil, 2007). For example, children will imitate arbitrary actions to open a box, such as tapping it with a stick, presumably assuming actions that are obviously causally superfluous have a nonobvious function (Horner & Whiten, 2005; Lyons et al., 2007). However, children do not imitate nonfunctional actions indiscriminately; if they can understand the reason behind an apparently irrelevant action, they selectively perform only the actions that efficiently achieve the intended goal (Gergely, Bekkering, & Király, 2002; Meltzoff, 1995; Schulz, Hooppell, & Jenkins, 2008). Thus, for instance, a child will not imitate inefficient actions, like turning on a lamp with her head, if she understands that the adult only performed the awkward action because his hands were otherwise occupied (Gergely, et al., 2002). In addition to learning specific behaviors and goals from observing adult actions, children can learn how to allocate effort. Studies with first and second-graders, and even 15-month old infants, have shown that children try harder at their own tasks after watching an adult model persist and achieve her goals (Leonard, Lee, & Schulz, 2017; Zimmerman & Blotner, 1979).

In most contexts, however, adults combine actions with words and children integrate this information. For instance, 6- and 7-year-olds try harder at their own task after watching a confident adult persist (e.g., an adult who says "I am sure I can separate these wires") than when watching a pessimistic adult persist ("I don't think I can separate these wires"; Zimmerman & Ringle, 1981). With respect to the relative importance of these cues, several studies support the adage that actions speak louder than words (Bryan & Walbek, 1970a, 1970bb; Rushton, 1975). For example, Rushton (1975) had 7- to 11-year-olds watch an adult play a game for tokens and act either selfishly or generously either without explanation or while preaching the value of taking or donating. When it was time for children to play the game, children copied the adult's actions, not their words. However, a recent large-scale, nationally representative study found the opposite effect, with parents' words, rather than their actions, affecting children's tendency to give to charity (Ottoni-Wilhelm, Zhang, Estell, & Perdue, 2017). Given that actions (rather than words) had an effect when the action was transparent to the children but words prevailed over actions when the actions were more opaque (children could observe the tokens directly but had less direct access to parents' charitable giving) it seems likely that the relative salience of different kinds of evidence affects how children weight it.

As is clear, myriad factors might affect children's persistence on a task including children's prior experience with the task, the expected outcome of the task (Alvarez & Booth, 2014), and children's observation of adult behavior and testimony (e.g., did the adult persist or not, succeed or fail, and express confidence or not, Zimmerman & Blotner, 1979; Zimmerman & Ringle, 1981). As also noted earlier, some previous studies have looked at many of these components individually and occasionally compared two sources of information (Zimmerman & Ringle, 1981). However, although relatively little work has looked at how children consider multiple forms of evidence to calibrate their persistence, ample work has shown that children are able to make rich generalizations from just a few examples provided by adult models (Bonawitz et al., 2011; Gweon & Schulz, 2011; Xu & Tenenbaum, 2007), especially when the adult engages the child pedagogically (Csibra & Gergely, 2009; Gergely, Egyed, & Király, 2007). Young children are also skilled at integrating their own and others' prior knowledge with data to make inferences across a range of tasks (Griffiths, Sobel, Tenenbaum, & Gopnik, 2011; Magid & Schulz, 2015; Schulz, Bonawitz, & Griffiths, 2007), including tasks which require judgments about the relative costs and rewards of their own and others' actions (Jara-Ettinger, Tenenbaum, & Schulz, 2015; Liu, Ullman, Tenenbaum, & Spelke, 2017; Sommerville et al., 2018). For example, when deciding whether to help someone else, infants integrate information about the costs of actions (easy or difficult) with the intrinsic reward of the action (whether the recipient is someone who shares their preferences or not; Sommerville et al., 2018). This suggests that children may be able to combine information from adults' actions, outcomes, and testimony with information about their own costs and rewards to decide when it is reasonable to engage in costly, effortful actions.

Here, we look at how preschool-age children integrate information from adults' actions, outcomes, and testimony to decide how hard to try. We tested children in an uninstructed condition (Experiment 1) and in response to three kinds of testimony. Past work has looked at how parent's language of encouragement influences children's persistence and motivation (Hokoda & Fincham, 1995; Jose & Bellamy, 2012), but little work has explored the effects of the various naturalistic ways

that parents try to motivate children. Given our interest in how parents genuinely motivate their children to try, here we focused on testimony reflecting common messages children hear about persistence in the real world: an honest expectations manipulation ("this task is made for adults and might be hard for kids"; Experiment 2), a "pep talk" manipulation meant to encourage the children ("I have a lot of confidence in you—you're going to do a great job"; Experiment 3) and a statement of values manipulation ("I think it's super important when something is tricky to try your best and not give up"; Experiment 4). While some of the testimony tested may be conceptually overlapping (e.g., Experiments 2 and 4 both mention task difficulty), we are most interested in testing commonly used naturalistic messages to children whether or not these forms are wholly distinct. Children heard each message in a baseline condition in which no actions or outcomes were demonstrated, as well as in a 2 × 2 design, crossing adult effort (high/low) and outcomes (success/failure) for a total of 20 conditions across the four experiments.

Given previous work showing that infants and school-aged children try harder after watching an adult try hard and succeed (Leonard et al., 2017; Zimmerman & Blotner, 1979), we predicted that preschool age children would try harder after watching an adult try and succeed compared to effortlessly succeed in the no testimony condition. However, we did not expect children to try harder after watching an adult effortfully fail versus effortlessly fail. Instead, we thought children would behave rationally, and assume that if a task was too difficult for an adult, then it would be too difficult for them no matter how hard they tried. In other words, we only expected effort to impact children's persistence in cases where the experimenter succeeded at reaching her goals.

While all three forms of testimony tested are naturally used to encourage persistence, we predicted that they might not all facilitate persistence equally. Specifically, we predicted that explicitly telling children that a task might be hard could eliminate the need for children to rely on adult effort to calibrate their own persistence. In these situations, children should anticipate that the task is hard and thus persist when the adult succeeds at reaching her goal, whether or not the adult tried hard. We were agnostic about whether pep talks and statements of values might impact children. They might disregard the message and focus only on the adult's actions; they might attend to the message and persist regardless of the adult's actions, or the message might affect children's persistence selectively (e.g., only when the adult practices what she preaches). Furthermore, one kind of message might be more effective than the other. However, across all testimony conditions, we predicted that, as with the effort manipulation, children should be sensitive to whether the adult succeeds or fails at reaching her goal. In the cases where the adult fails, children should expect the task to be too difficult for them, no matter what kind of encouragement they hear from the adult.

Across experiments, we hold children's prior knowledge constant by giving them a novel task, a wooden box with something inside of it (see Figure 1), that is neither obviously within, nor outside of, their ability range. That is, all children should initially be uncertain about how difficult the task is. (In fact, the children's tasks are impossible in all conditions, allowing us to explore the full range of children's persistence.) Our dependent measure was how long children engaged with the box. Persistence can be operationalized in many ways but one concern is that any overt behavioral measure will fail to capture cognitive effort (how long children spend thinking about the task, evaluating what they have already tried, and planning future actions). Thus, total time on task seemed more likely to capture children's overall engagement. Of course, this measure may also capture thoughts and behaviors that are irrelevant to the target task (children's minds may be wandering, or they may be playing with or exploring the stimuli for reasons unrelated to the target goal). However, given that there are no obvious affordances here that could help the child achieve the goal (and that the task is in fact impossible) there is no in principle way, to distinguish behaviors that are relevant to the goal from those that are irrelevant: A child who flips the box over or shakes it may just be playing, or she may be trying to discover a hidden mechanism to open the box. Thus, rather than restrict our measure of persistence to a necessarily arbitrary subset of actions, we focused on total time engaged with the task broadly. Although this measure may overestimate children's persistence, there is no reason to suppose it would do so in ways that differ systematically across conditions. Nonetheless, it is important to note that persistence here refers to persistent engagement broadly; we cannot be sure that it indicates persistence on the specific target goal.

We also have adults and children perform seemingly identical tasks so that children should readily learn from watching and listening to the adults. Given previous work suggesting that even 15-month-old toddlers' persistence is affected by

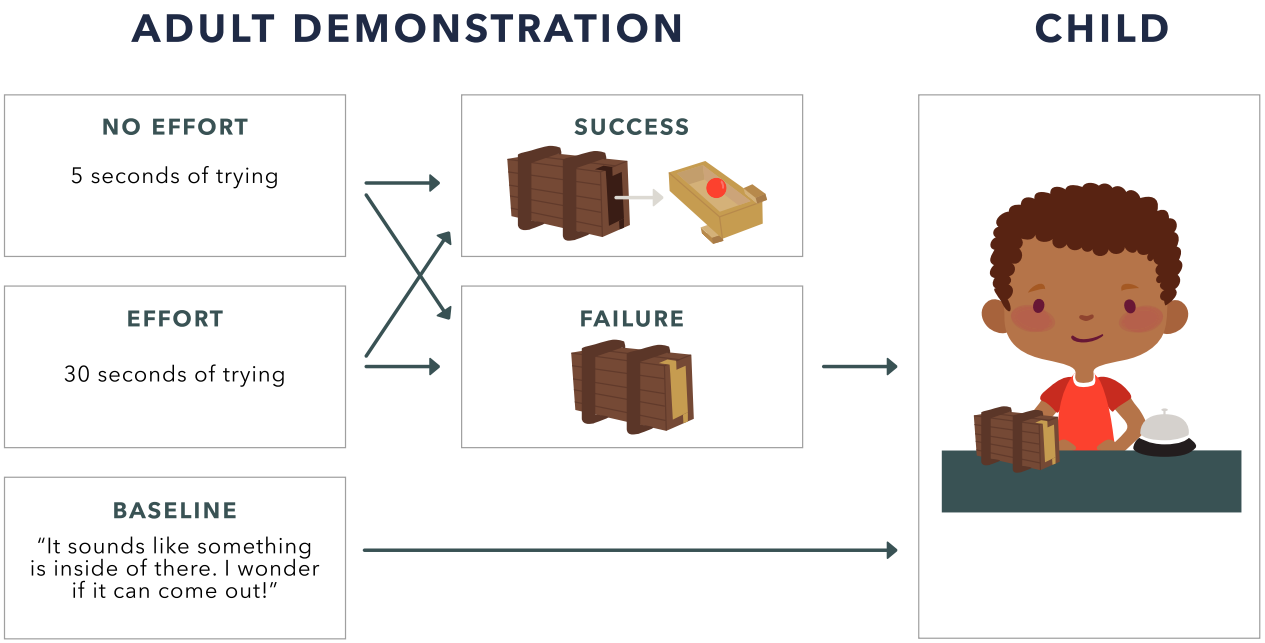

Figure 1. Experiment 1 schematic. Children were randomly assigned to one of five conditions: No Effort Success, Effort Success, No Effort Failure, Effort Failure, or Baseline. In the Effort conditions, the experimenter tried to open their toy box for 30 s. In the No Effort conditions, the experimenter spent 5 s trying to open the box. In the Success conditions, the experimenter successfully opened the box and in the Failure conditions, the experimenter never opened the box. In the Baseline condition the experimenter didn't model any action. Next, children were given their own box (that was secretly impossible to open) to play with. Their box was identical to the adult's box, but made a different sound when shaken, indicating that a different toy was inside. The children were told they could ring the bell when they were all done playing and were timed out at 4 min. A similar design was used for Experiments 2–4 with small additions.

adult effort (Leonard et al., 2017), we were interested in looking at the youngest ages in which we could see how children integrated all of these factors. We focused on 4- and 5-year-olds for three reasons. First, pilot data suggested that 4- and 5-year-olds, unlike toddlers, would be able to complete the task even in the conditions where they saw the adults fail to achieve the goal. Second, we wanted to be confident that children had sufficient verbal abilities to understand the task instructions in all conditions. Finally, given the real-world importance of persistence to success, we wanted to focus on how adult behavior affected children just starting the process prior to formal education. Within these constraints, we ask how adult actions, outcomes, and verbal testimony affect children's task persistence.

Experiment 1: Uninstructed

Method

Participants and Materials

One hundred and forty-four 4- to 5-year-old children were recruited for the study at a urban children's museum, but only 130 were included in the data analysis (M = 57.60 months; range = 48–71 months, 51% girls) due to parental interference (n = 2), not reaching criteria with the "all done playing" bell (n = 2), not touching the toy box before ringing the bell (n = 6), successfully opening the toy box (which was supposed to be impossible; n = 1), or experimental error (n = 3). Across all experiments most of the children were white and middle class, however, a range of ethnicities and socioeconomic backgrounds reflecting the diversity of the local population (47% European American, 24% African American, 9% Asian, 17% Latino, 4% two or more races) and the museum population (29% of museum attendees receive free or discounted admission) were represented throughout. Children were randomly assigned to one of five conditions: No Effort Success, Effort Success, No Effort Failure, Effort Failure, or Baseline (n = 26/condition; ages were matched across conditions, B = 0.08, 95% CI [−0.72, 0.86]). Confidence intervals reported throughout from bootstrap with 10,000 samples). A power analysis indicated that we would need to collect 26 subjects to find large differences in planned condition contrast t-tests (d = .8, power = 0.8). Thus, we collected data on 130 children (26/condition).

Two 18.49 × 8.51 × 8.51 cm wooden boxes were used. The boxes looked like they could open in a few different ways, but they actually opened through a secret sliding notch. A marble was hidden in the experimenter's box and a rubber frog was hidden in the child's box. These toys produced different sounds when the box was shaken and were used to indicate that the boxes were different. A bell was used for the child to indicate that she was "all done playing" and a toy bear was used to demonstrate the use of the bell.

Procedure

Children were tested individually in a quiet room in an urban children's museum. In all conditions, the experimenter first introduced children to the "all done playing" bell. The experimenter pretended to play with the stuffed bear, and then said, "I'm all done playing" and rang the bell. Children were then asked to play with the bear and indicate when they were all done playing by ringing the bell. The procedure was repeated if children did not use the bell to indicate when they were done playing. If children failed to ring the bell after three repetitions, they were excluded from the study.

In all conditions except baseline, the experimenter then brought out her wooden box and shook it, saying, "I think there's something inside of there!" In the No Effort Success condition, the experimenter took approximately 5 s to find the sliding notch and opened the box. In the Effort Success condition, the experimenter made repeated attempts to open the box for 30 s before locating the sliding notch, opening it, and saying, "Awesome! Look there's a marble inside." In the No Effort Failure condition, the experimenter manipulated the box for 5 s and then said, "I can't do it. Okay, I'm done." In the Effort Failure condition, the experimenter performed the same actions as in the Effort Success condition except that at the end of 30 s, instead of identifying the sliding notch and opening the box, she said, "I can't do it. Okay, I'm done." Thus, in both of the failure conditions, the experimenter never successfully opens the box. In the Baseline condition, there was no experimental modeling (see Figure 1).

Next, the experimenter told the children that she needed to go review some paperwork with their parents and that they would get to play with a toy by themselves. Children were also told that, because the experimenter would be on the other side of the room talking with their parents, they should ring the bell to indicate when they were done playing. In the Baseline condition only, the experimenter then introduced the children's box to them, shaking it and saying, "it sounds like something is inside of there. I wonder if it can come out!"

Children were given a box to play with that looked identical to the experimenter's box but had a different toy inside and was impossible to open. The experimenter then moved out of children's line of sight to talk to the parents. If children asked a question during the free play period the experimenter always responded by saying "I'm going over some paperwork with your mom/dad right now. You can ring the bell when you're all done playing" or "This toy is just for you, so we can't help you with it. Just let us know when you are all done playing by ringing the bell." If children stopped touching the toy for 5 s, the experimenter would ask "Are you all done playing?" The experiment was terminated when children rang the bell or after 4 min, whichever came first. The experimenter always ended by saying, "Oops, I gave you the wrong box to open!" Children were given a different box and, working with the experimenter, successfully opened the box in the end.

Results and Discussion

As noted earlier, there are many different ways to operationalize effort (number of discrete actions, number of repeated actions, force applied, time manipulating the toy, coordination of eye gaze and hand movements, etc.). However, in addition to overt behavior, children also engage in cognitive effort (planning, thinking, etc.), which may have no behavioral consequence. Thus, this kind of cognitive effort can only be captured by considering children's total time on the task. For this reason, and for simplicity and reliability of coding across tasks and conditions, we operationalized children's persistence across all conditions as latency to ring the bell. Latency to ring the bell was coded from videotape by two coders blind to condition (80% of videos were double-scored with inter-rater reliability $r > .99$, $p < .001$). Additionally, however, we examined action-based indices of effort to ensure that the results were not dependent on our choice of latency as a measure of children's persistence. A coder blind to condition scored every participant's video in the Effort Success, No Effort Success and Baseline conditions for the total time children spent performing the following actions: shaking the box, turning the box, banging the box, pulling the box, holding the box, resting her hands on the box, or

other (see Table S1 for descriptive statistics). The combined time children spent doing each of these actions correlated highly with children's latency to ring the bell $r(76) = .99$, $p < .001$. These correlations held when we excluded behavior classified as other $r(76) = .98$, $p < .001$, and passive actions (resting hands on the box, holding the box; $r(76) = .93$, $p < .001$).

Across all four experiments, we used the same analysis approach. First, we ran a multiple regression looking at the effects of Effort and Outcome, and their interaction, on children's persistence. The dependent measure did not adhere to a normal distribution in this experiment or any of the experiments to follow, so it was natural log (ln) transformed to better adhere to a normal distribution for linear models. Next, we ran planned follow-up comparisons for specific conditions using nonparametric analyses (we used nonparametric tests here because transforming the data did not fix normality well for all follow-up comparisons). To look at the directionality of any significant effects, we compared these conditions to Baseline.

To simultaneously explore how Effort and Outcome affected children's performance, we performed a multiple regression where seconds playing with the toy was input as the dependent variable and Effort, Outcome, and their interaction as the independent variables (model $R^2_{adj} = .30$). The regression revealed a positive effect of Outcome, with children playing with the toy for a longer amount of time in the Success conditions than the Failure conditions $B = 0.70$ ln seconds, 95% CI [0.29, 1.14], $t(100) = 3.26$, $p = .002$. There was no effect of Effort $B = 0.01$ ln seconds, 95% CI [−0.41, 0.44], $t(100) = 0.03$, $p = .975$. There was a trend toward an interaction between Outcome and Effort, with children trying harder than any other condition when the experimenter tried hard and succeeded $B = 0.54$ ln seconds, 95% CI [−0.07, 1.13], $t(100) = 1.77$, $p = .080$, see Figure 2, Tables 1 and 2 for medians and means across conditions, and Table 3.

We also ran planned comparisons on the contrasts of interest, looking at the effect of Effort separately in the Success and Failure conditions and looking at the effect of Outcome separately in Effort and No Effort conditions. To look at the directionality of any significant effects, we follow-up by comparing these conditions to Baseline. To standardize the reporting of results across conditions and experiments, we report the results of all analyses, including some that provide redundant information, opting to risk some repetition for the sake of completeness and consistency of analyses across experiments.

In the Success conditions, there was an effect of Effort such that children tried harder in the Effort than the No Effort condition ($W = 476.50$, $p = .011$, $r = -.35$). There was a trend for children to persist more in the Effort Success condition than Baseline ($W = 242.00$, $p = .080$, $r = -.24$), but there was no difference in children's persistence between the No Effort Success condition and Baseline ($W = 351.50$, $p = .812$, $r = -.03$). In the Failure conditions, there was no effect of effort, with no difference between Effort Failure and No Effort Failure ($W = 341.50$ $p = .956$, $r = -.01$).

Looking at Outcomes, there was an effect of Outcome in both the Effort and No Effort conditions such that children tried harder given Success than Failure (Effort: $W = 86.50$, $p < .001$, $r = -.64$; No Effort: $W = 180.00$, $p = .004$, $r = -.40$). In the Effort conditions there was, as noted, a trend for children to try harder given Success than Baseline ($W = 242.00$, $p = .080$, $r = -.24$); given Failure, children persisted less than they did at Baseline ($W = 483.50$ $p = .008$, $r = -.37$). In the No Effort conditions, children's persistence did not differ between Success and Baseline ($W = 351.5$ $p = .812$, $r = -.03$) but did differ between Failure and Baseline, with children persisting less given Failure ($W = 488.00$, $p = .006$, $r = -.38$).

The results of Experiment 1 suggest that children's persistence is affected jointly by the adult's persistence at a goal and whether the adult ultimately succeeds at her goal or not. Children were most likely to persist when the adult tried hard and succeeded; however, they were least likely to persist when the adult failed, regardless of whether she modeled effort or not. Indeed, seeing the adult fail pushed children's persistence below baseline. Note that in addition to failing in the Failure conditions the experimenter commented on her failure, saying, "I can't do it." This strong, declarative statement might have further convinced children of the difficulty of the task, much as language linking people's abilities with their identity ("you are a good drawer"; e.g., Cimpian et al., 2007; Kamins & Dweck, 1999) and generic language focused on the success or failure of children by gender (Cimpian, 2010; Rhodes & Brickman, 2008) impacts children. Thus, the interpretation of the evidence in the failure conditions itself might have involved an integration of evidence and testimony. Overall, this pattern of results suggests that, even given similar tasks and goals, children do not merely imitate adult actions. Rather, children integrate information about adults' effort and outcomes to guide their behavior.

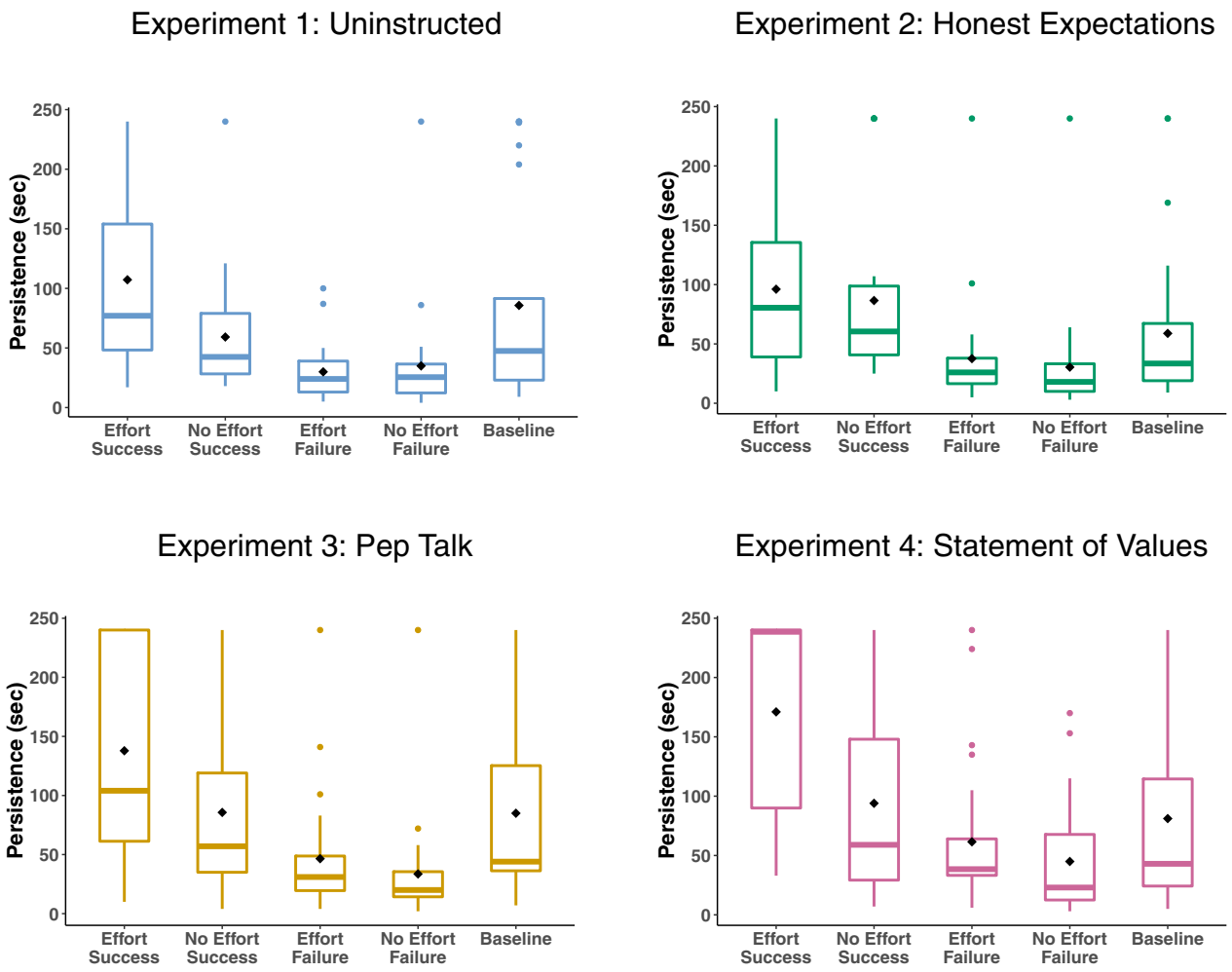

Figure 2. Results from Experiment 1–4. The top and the bottom of the boxes correspond to the first and third quartiles (the 25th and the 75th percentiles). The thick horizontal line in the middle of the boxes demarks medians. The upper whisker extends from the third quartile to the largest value no further than 1.5 interquartile ranges from the third quartile. The lower whisker extends from the 25th percentile down to the smallest value no further than 1.5 interquartile ranges from the first quartile. The dots are values more than 1.5 times the interquartile range above the third quartile. The black diamonds indicate means. See text for statistical analyses.

Table 1
Medians of Child Persistence (Seconds) Across Experiments by Condition

	Effort success	No effort success	Effort failure	No effort failure	Baseline
Exp. 1: Uninstructed	77.00	45.50	24.00	25.50	47.50
Exp. 2: Honest expectations	80.50	60.50	26.00	18.00	33.50
Exp. 3: Pep talk	104.00	57.00	31.00	20.00	44.00
Exp. 4: Statement of values	238.50	59.00	38.50	23.00	43.00

Experiment 2: Honest Expectations

The results from Experiment 1 suggest that children calibrate their effort based on adult actions. However, adults often convey messages to children with both actions and words. One way adults can signal that a task will require effort is simply to tell

Table 2
Means of Child Persistence (Seconds) Across Experiments by Condition

	Effort success	No effort success	Effort failure	No effort failure	Baseline
Exp. 1: Uninstructed	107.23	56.19	29.96	34.92	85.69
Exp. 2: Honest expectations	96.12	86.58	37.62	30.42	58.88
Exp. 3: Pep talk	137.85	85.65	46.50	33.58	84.96
Exp. 4: Statement of values	171.04	94.00	61.54	44.96	81.12

kids that the task will be hard. A parent may say to a child "This could be tricky" or a teacher might say, "We're going to try something more difficult now." Explicitly communicating that a task is hard might obviate the need for children to use adult effort to estimate the task's difficulty. If children are forewarned that a task could be difficult for them (i.e., difficult for children but not for adults), then they might persist simply because they expect the task to be challenging. Even preschoolers have some understanding that effort scales with difficulty (Gweon, Asaba, & Bennett-Pierre, 2017). Thus, children may try harder if an adult tells them that a task will be hard for them, regardless of whether the adult herself tries hard or not. Critically, however, children should still be sensitive to whether the adult succeeds or fails (the adult outcome). If the adult fails on a difficult task, children might now expect the task to be out of reach for them, and thus not worth persisting on at all. In Experiment 2 we look at how children might integrate explicit messages about task difficulty with observations of adult effort and outcomes by replicating the design in Experiment 1, but first telling children that the task is made for adults and thus might be hard for kids.

Method

Participants and Materials

One hundred and fifty 4- to 5-year-old children were recruited for the study, but only 130 were included in the data analysis (M = 59.03 months; range = 48–71 months, 49% girls) due to parental interference (n = 3), not reaching criteria with the "all done playing" bell (n = 1), not touching the toy box before ringing the bell (n = 6), or experimental error (n = 10). Children were randomly assigned to one of five conditions: No Effort Success, Effort Success, No Effort Failure, Effort Failure, or Baseline (n = 26/condition; ages were matched across conditions, B = 0.36, 95% CI [−0.36, 1.07]).

Table 3
Unstandardized Beta Values for Multiple Regressions on Persistence (ln Transformed Seconds) Across Experiments

	Effort	Outcome	Effort × Outcome
Exp. 1: Uninstructed	.01	.70**	.54†
Exp. 2: Honest expectations	.36	1.31***	−.32
Exp. 3: Pep talk	.37	.94**	.22
Exp. 4: Statement of values	.42	.77**	.50

†p < .1. **p < .01. ***p < .001.

All materials were the same as in Experiment 1 except for the addition of a "latches activity board" designed for preschool children. In Experiments 2–4 a rubber dice was placed inside the child's box instead of a rubber frog.

Procedure

The procedure was the same as in Experiment 1 except as follows. After introducing the "all done playing" bell, the experimenter said that they were going to play with some toys today. Then she took out two toys: the puzzle box (made for adults) and the latches activity board (made for preschoolers). She said "one of these toys is for grownups and the other is for kids your age. Which one do you think is for kids your age? And which one is for grownups?" If children answered incorrectly, they were corrected (105/130 answered this correctly). Then the experimenter asked children to point to which of the people at the table (the experimenter or the child) was a kid and which was a grownup. The experimenter then said that they were going to get to play with the games "but as you can see, some of the toys are made for grownups, so they can be hard for kids." The "grownup" toy (the puzzle box) was then used by the experimenter for the remainder of the procedure, and the child was given a puzzle box for the test task. The experimenter then modeled the actions and outcomes appropriate to the target condition as in Experiment 1. In the Baseline condition in this experiment and all following experiments, there was no experimenter modeling after the testimony. Finally, she handed children

their own box to play with and again reminded them "that some of the toys will be hard for kids because they are actually made for grownups."

Results and Discussion

Coding and analyses were identical to those in Experiment 1. Results were coded from videotape by two coders blind to condition (given the high inter-rater reliability in Experiment 1, we reduced the percentage of videos recoded to 30% in this and subsequent experiments; inter-rater reliability was high $r > .99$, $p < .001$). We performed a multiple regression where seconds playing with the toy was input as the dependent variable and Effort, Outcome, and their interaction as the independent variables (model $R^2_{adj} = .32$). There was a positive effect of Outcome, with children playing with the toy longer in the Success conditions than Failure conditions $B = 1.31$ ln seconds, 95% CI [0.83, 1.80], $t(100) = 5.60$, $p < .001$. Again, there was no overall effect of experimenter Effort $B = 0.36$ ln seconds, 95% CI [−0.12, 0.87], $t(100) = 1.54$ $p = .126$. There was no interaction between Effort and Outcome $B = -0.32$ ln seconds, 95% CI [−0.96, 0.33], $t(100) = -0.97$, $p = .333$, see Figure 2 and Tables 1 and 2 for medians and means across conditions.

As in Experiment 1, we ran planned comparisons on the contrasts of interest looking at the effect of Effort separately in the Success and Failure conditions, and looking at the effect of Outcome separately in Effort and No Effort conditions, following up on any significant effects with comparisons to the Baseline condition. As predicted, children here used the verbal testimony rather than the experimenter's actions to calibrate their expectations of task difficulty; there was no effect of how hard the experimenter tried in the Success conditions of Experiment 2 (in contrast to the effect of Effort in the Success conditions of Experiment 1; $W = 356.00$, $p = .748$, $r = -.04$). As in Experiment 1, there was also no effect of Effort in the Failure conditions ($W = 412.00$, $p = .178$, $r = -.19$).

However, as predicted, there was an effect of Outcome in both the Effort and No Effort conditions such that children tried harder after observing Success than Failure (Effort: $W = 132.00$, $p < .001$, $r = -.52$; No Effort: $W = 79.00$, $p < .001$, $r = -.66$). In the Effort conditions, children tried harder given Success than Baseline ($W = 210.50$, $p = .020$, $r = -.32$), whereas children's persistence did not differ between Failure and Baseline ($W = 408.50$, $p = .200$, $r = -.18$). In the No Effort conditions, children persisted more given Success than at Baseline ($W = 202.50$, $p = .013$, $r = -.34$) and persisted less given Failure than at Baseline ($W = 483.00$, $p = .008$, $r = -.37$).

The results of Experiment 2 suggest that children use adult testimony to calibrate their persistence: they try harder when they expect a task to be difficult even if they see an adult succeed effortlessly. Moreover, telling children a task will be hard *and* showing them that it is possible (i.e., because the adult succeeds) leads them to try harder than just telling them it will be difficult (as in the Baseline condition). However, neither the adult's testimony nor the adult's example of persistence increases children's persistence above baseline when the adult fails—and if the adult fails without trying, children's persistence drops below baseline.

Experiment 3: Pep Talk

Adults sometimes adopt a very different strategy when they want their children to persist; rather than telling children a task will be difficult, they give the child a "pep talk"—encouraging the child, telling the child the task is achievable, and expressing confidence in the child's ability to succeed. Some research suggests that this form of verbal encouragement is effective at increasing participants' effort in physical tasks (Bickers, 1993; McNair, Depledge, Brettkelly, & Stanley, 1996). Less is known about the efficacy of broad encouragement in academic contexts, but some studies suggest that encouraging children helps them stay on task and increases their performance (Brown & Howard, 2014; Guéguen, Martin, & Andrea, 2015). In Experiment 3 we look at how children integrate pep talks with observations of adult effort and outcomes by replicating the design in Experiment 1, but first encouraging children.

Method

Participants and Materials

One hundred and thirty-seven 4- to 5-year-old children were recruited for the study, but only 130 were included in the data analysis ($M = 59.25$ months; range = 48–71 months, 52% girls) due to parental interference ($n = 5$) and experimental error ($n = 2$). Children were randomly assigned to one of five conditions: No Effort Success, Effort Success, No Effort Failure, Effort Failure, or Baseline ($n = 26$/condition; ages were matched across conditions, $B = 0.34$, 95% CI [−0.47, 1.12]). All materials were the same as in Experiment 1.

Procedure

The procedure was the same as in Experiment 1 except as follows. Before handing children their toy, the experimenter said, "Ok, now it's time for you to play with your toy. I think you will do a great job playing with this toy! I have a lot of confidence in you! You got this!" The experimenter again reminded children that they could indicate that they were all done playing by ringing the bell and again said "You got this" before actually handing the toy to the child.

Results and Discussion

Coding and analyses were identical to those in Experiment 1. Results were coded from videotape by two coders blind to condition (30% of videos were doubled scored with inter-rater reliability $r > .99$, $p < .001$). We performed a multiple regression where seconds playing with the toy was input as the dependent variable and Effort, Outcome, and their interaction as the independent variables (model $R^2_{adj} = .25$). As in previous Experiments, there was a positive effect of Outcome, with children playing with the toy for a longer amount of time in the Success conditions than the Failure conditions $B = 0.94$ ln seconds, 95% CI [0.37, 1.48], $t(100) = 3.55$ $p = .001$. There was no main effect of experimenter Effort $B = 0.37$ ln seconds, 95% CI [−0.12, 0.84], $t(100) = 1.38$, $p = .172$ and no interaction between Effort and Outcome $B = 0.22$ ln seconds, 95% CI [−0.51, 0.97], $t(100) = 0.58$, $p = .565$, see Figure 2 and Tables 1 and 2 for medians and means across conditions.

As before, we ran planned comparisons on the contrasts of interest looking at the effect of Effort separately in the Success and Failure conditions and looking at the effect of Outcome separately in Effort and No Effort conditions, following up on any significant effects with comparisons to the Baseline condition. In Success conditions, there was an effect of Effort, with children trying harder in the Effort condition than the No Effort condition ($W = 459.50$, $p = .026$, $r = -.31$). Children in the Effort condition persisted more than children at Baseline ($W = 208.00$, $p = .017$, $r = -.33$); there was no difference in children's persistence in the No Effort condition and Baseline ($W = 314.50$, $p = .673$, $r = -.06$). There was no effect of Effort in the Failure conditions ($W = 421.50$, $p = .129$, $r = -.21$).

There was a significant effect of Outcome in both the Effort and No Effort conditions such that children tried harder given Success than Failure (Effort: $W = 125.00$, $p < .001$, $r = -.54$; No Effort: $W = 151.00$, $p = .001$, $r = -.47$). In the Effort conditions, as noted, children tried harder given Success than Baseline ($W = 208.00$, $p = .017$, $r = -.33$); but persisted less given Failure than Baseline ($W = 448.00$, $p = .045$, $r = -.28$). In the No Effort conditions, children's persistence did not differ between Success and Baseline ($W = 314.50$, $p = .673$, $r = -.06$) but given Failure, children persisted less than they did at Baseline ($W = 514.00$, $p = .001$, $r = -.45$).

The results of Experiment 3 mirror the results of Experiment 1: children try harder after seeing an adult try hard and succeed than when they see her effortlessly succeed, and also try harder after seeing success than failure, regardless of adult effort. Unlike Experiment 2, a pep talk did not obviate the difference between the Effort and No Effort Success conditions. That is, warning children that the task might be difficult seemed to allow them to ignore the adults' relatively minimal effort in the No Effort Success condition, so that they persisted despite the adults' failure to model persistence. In contrast, encouraging children did not overcome the impact of the adults' effortless success, and children were less likely to persist.

Note that the testimony in Experiment 3 was misleading. The children were told, "You got this" when in fact, the task was impossible for them. In this respect, the testimony in Experiment 3 differed from the (more) truthful testimony in Experiment 2, in which children were warned that the task would be hard (indeed, the task was impossible). Arguably, the minor deception involved in the pep talk mirrors real world behavior; adults may well offer encouragement to children because they believe encouragement is helpful, regardless of whether or not the adult is absolutely certain that the child can accomplish the task. The current results suggest that adults may be correct in believing that encouragement (regardless of whether it accurately reflects children's abilities to achieve the task) has a positive impact on children's persistence. Children were numerically more likely to perform at ceiling in the Effort Success condition of Experiment 3 than in either of the other two experiments: in Experiment 3, 10/26 children (38%) persisted for the whole 4 min (the maximum time allowed); in contrast only 2/26 (8%) performed at ceiling in Experiment 1 and only 6/26 (23%) did so in Experiment 2 (see Figure 3). The results across Experiments 2 and 3 suggest both that children integrate adult testimony with observations of their actions and their

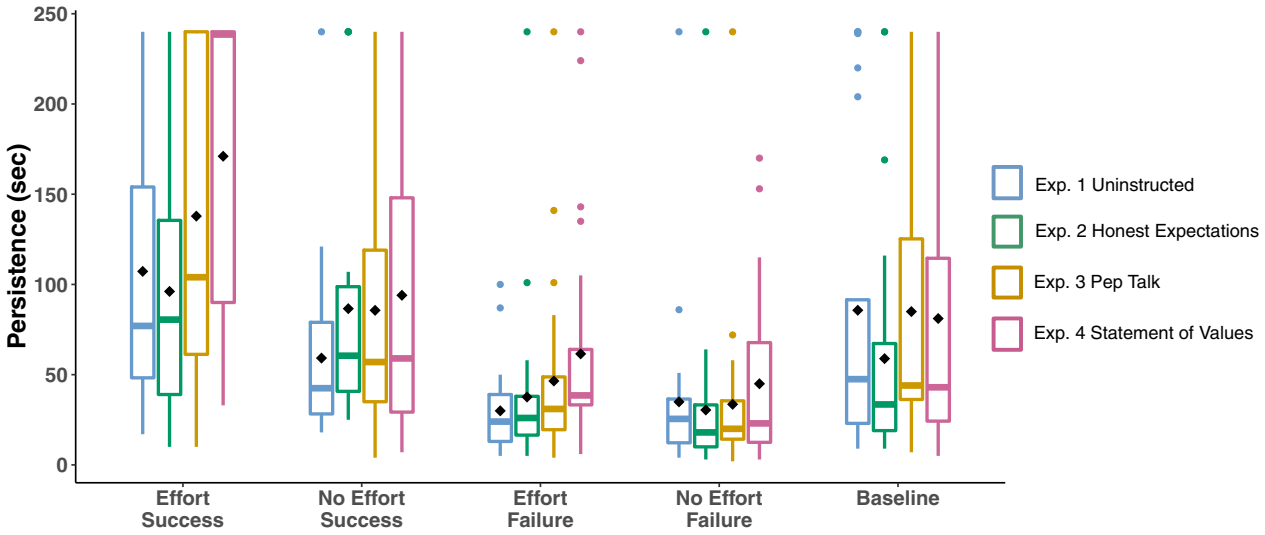

Figure 3. Results from Experiment 1–4 on the same axis. See Figure 2 text for explanation of plot style.

outcomes, and that different kinds of testimony may impact children's behavior in distinct ways.

Experiment 4: Statement of Values

Thus far we have looked at how children respond to observations of adult effort and outcomes (Experiment 1), the impact of this evidence when children are truthfully told that a task will be hard (Experiment 2), and the impact of this evidence when children are falsely told that the task is within their reach (Experiment 3). In Experiment 4 we turn to a final common message children hear when adults want them to work hard: that working hard is valuable and important. That is, here we look at how children respond when adults simply proselytize the value of effort.

In recent years, character traits (so called noncognitive abilities), like grit, have garnered widespread attention due to their relationship to academic success and relative amenability to intervention over more seemingly stable, yet important traits, like IQ (Cunha & Heckman, 2008; Duckworth & Seligman, 2005; Eskreis-Winkler et al., 2014; Heckman & Kautz, 2013; Tough, 2012). Furthermore, American adults value effort: 60% of them believe that working hard in school is more important than doing well (Ames & Archer, 1987). This belief in hard work is oftentimes reflected in how parents speak to their children about how to deal with challenges (Haimovitz & Dweck, 2016; Hokoda & Fincham, 1995; Jose & Bellamy, 2012). Some schools have gone so far as to implement "Character Growth Cards" and organizations like the "Character Lab" have been formed to help schools teach and assess noncognitive skills (https://www.characterlab.org/). Yet little research has examined the effect of adults' explicit messages about the value of effort on children's effortful behavior and we do not know how children integrate this testimony with models of adult effort and outcomes. In Experiment 4 we replicate the design in Experiment 1 but first tell children that, "It's important to try your best and not give up."

Method

Participants and Materials

One-hundred and seventy 4- to 5-year-old children were recruited for the study, but only 130 were included in the data analysis (M = 59.71 months; range = 48–71 months, 60% girls) due to parental interference (n = 9), not reaching criteria with the 'all done playing' bell (n = 3), fussing out (n = 2), experimental error (n = 6), or getting the manipulation check (described next) wrong (n = 20). Note that the results of Experiment 4 do not change if the children who failed the manipulation check are included (see Supporting Information). Children were randomly assigned to one of five conditions: No Effort Success, Effort Success, No Effort Failure, Effort Failure, or Baseline (n = 26/condition; ages were matched across conditions, B = 0.49, 95% CI [−0.28, 1.27]). All materials were the same as in Experiment 1.

Procedure

The procedure was the same as in Experiment 1 except as follows. After introducing the "all done playing" bell, the experimenter asked the child if they had ever done something really hard before. Then the experimenter said,

> Lots of things are really hard, aren't they? Well we are going to play with some toys today and, sometimes, new toys are tricky. But you know what the best thing to do is when something is tricky? To try your best and not give up. Do you agree? So what do you think the best thing to do is when something is tricky? (Let child answer) Yeah, it's just really important to try our best and not give up.

The experimenter than proceeded to play with their box (in all conditions but Baseline), reminding children that they thought it was "super important when something gets tricky to try your hardest and not give up." Before giving children their toy to play with, they again reminded them of the importance of trying one's hardest.

We included a manipulation check in Experiment 4 to increase our confidence that children encoded the verbal testimony. To ensure that our results reflected children who had encoded the message, we used the manipulation check as exclusion criteria, excluding children from analysis if they failed to remember the moral message. (No results change, however, if these children are included—see Supporting Information) Children were asked if the experimenter said that it was really important to "keep your room tidy and clean" or to "try your best and not give up" (order counter balanced). If children didn't answer, they were again prompted with the open-ended question "What did we say was the best thing to do when something is tricky?"

Results and Discussion

Coding and analyses were identical to those in Experiment 1. Results were coded from videotape by two coders blind to condition (30% of videos were doubled scored with inter-rater reliability $r > .99$, $p < .001$). We performed a multiple regression where seconds playing with the toy was input as the dependent variable and Effort, Outcome, and their interaction as the independent variables (model $R^2_{adj} = .28$). As in previous Experiments, there was a positive effect of outcome, with children playing with the toy for a longer amount of time in the Success conditions versus the Failure conditions ($B = 0.77$ ln seconds, 95% CI [0.16, 1.32], $t(100) = 2.87$, $p = .005$). There was a nonsignificant trend for a main effect of experimenter Effort ($B = 0.42$ ln seconds, 95% CI [−0.08, 0.96], $t(100) = 1.59$, $p = .115$); there was no interaction between Effort and Outcome ($B = 0.50$ ln seconds, 95% CI [−0.26, 1.23], $t(100) = 1.31$, $p = .193$, see Figure 2 and Tables 1 and 2 for medians and means across conditions).

As before, we ran planned comparisons on the contrasts of interest looking at the effect of Effort separately in the Success and Failure conditions and looking at the effect of Outcome separately in Effort and No Effort conditions, following up on any significant effects with comparisons to the Baseline condition. In Success conditions, there was an effect of Effort, with children trying harder in the Effort condition than the No Effort condition ($W = 516.00$, $p = .001$, $r = -.46$). Children in the Effort condition persisted more than children at Baseline ($W = 136.50$, $p < .001$, $r = -.52$); there was no difference in children's persistence in No Effort condition and Baseline ($W = 306.50$, $p = .570$, $r = -.08$). In the Failure conditions, there was a nonsignificant trend for children in the Effort condition to try more than children in the No Effort condition ($W = 424.50$, $p = .115$, $r = -.22$).

There was a significant effect of Outcome in both the Effort and No Effort conditions such that children tried harder given Success than Failure (Effort: $W = 89.00$, $p < .001$, $r = -.64$; No Effort: $W = 209.50$, $p = .019$, $r = -.32$). In the Effort conditions, as noted, children tried harder given Success than Baseline ($W = 136.50$, $p < .001$, $r = -.52$); but there was no difference between Failure and Baseline ($W = 363.50$, $p = .647$, $r = -.06$). In the No Effort conditions, children's persistence did not differ from Baseline given either outcome (Success: $W = 306.50$, $p = .570$, $r = -.08$; Failure: $W = 442.00$, $p = .058$, $r = -.26$).

The results of Experiment 4 largely replicate the pattern found in Experiment 1 and Experiment 3: children try harder when they see adults try hard and succeed than when they see effortless success, and they also try harder when they see success rather than failure, regardless of adult effort. However, the combination of adults saying they value effort while modeling effortful success was particularly powerful: 13/26 children (50%) performed at ceiling in this condition; numerically more children than in any other condition of any other experiment (see Figure 3).

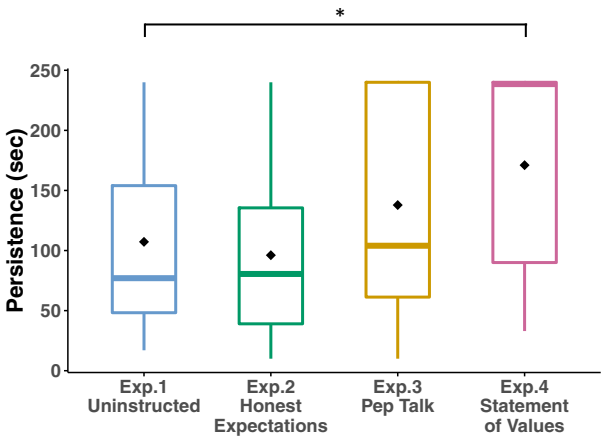

Figure 4. Persistence in the Effort Success conditions across the four experiments. The only testimony that significantly increased children's persistence above baseline (in blue) in the effort success condition was the statement of value testimony (in red). *$p < .05$ FDR corrected.

As is clear in Figure 3, testimony impacted children's persistence differentially only in the Effort Success conditions. While it would be desirable to run a full 2 (effort) × 2 (outcome) × 5 (testimony) model to detect interactions, we are significantly underpowered to run this model, even with our sizeable sample. However, we ran a post hoc Kruskal–Wallis test comparing the effect of testimony on children's persistence in the Effort Success Conditions, $H(3) = 12.01$, $p = .007$, see Figure 4. Follow-up Dunn comparisons revealed that only the statement of value testimony significantly increased children's persistence in the Effort Success condition above the Uninstructed condition (FDR corrected $p = .031$).

General Discussion

Across four experiments, we looked at how information about adults' actions, outcomes, and testimony affected preschoolers' persistence on novel tasks. Our goals in this study were threefold. First, we wanted to assess the extent to which children's persistence was malleable in the face of relatively small interventions. Second, we wanted to look at situations children might experience in the real world when they see parents try (more or less hard) at a task, succeed (or not), and give motivational messages to children. Finally, we wanted to see if any specific combination of factors might be especially effective at encouraging children's persistence.

Note that in principle, preschoolers might have been relatively immune to the evidence they observed. Their persistence on the tasks might have been governed by the properties of the toy, their intrinsic motivation to complete the task, or individual differences in temperament or mood. However, that was not the case. Children's response to the task was strikingly malleable: the range of median persistence varied 10-fold across conditions and experiments, from 18 s to almost 4 min. Moreover, we found this variation with only very simple interventions on adults' language, effort, and outcomes, mirroring the kinds of contexts children actually encounter. Underlying the variation, there was also remarkable consistency across all experiments: the dominant factor affecting children's persistence was whether the adult succeeded or failed at the task. Children tried harder in the Success conditions than the Failure conditions, and children's performance in the Failure conditions was at or below Baseline. Moreover, in all four experiments, there was no impact of adult effort when the adult failed to achieve the task. Rather, children's persistence remained low whether the adult tried hard or not. This suggests that children deploy their effort rationally; they do not spend a lot of time trying to achieve tasks when the evidence suggests that it is unlikely that they will succeed. However, children were sensitive to how hard the adult tried when the adult succeeded at the task. Across three of the four experiments, when the adult succeeded, children tried hard when the adult tried hard and were less persistent when the adult succeeded easily. These commonalities held across the studies despite the differences in what the adult said to the children. In this sense, we might conclude that actions speak louder than words, and that outcomes speak louder than both.

Nonetheless, children also listened to what adults said. Warning children that the task might be hard buffered children against seeing the adult succeed effortlessly. Only in that context were children as persistent in the Low Effort Success condition as the High Effort Success condition. Additionally, when the adult tried hard and succeeded, the words she said to the child mattered: when adults asserted the value of effort, half of the children persisted at ceiling. Critically, this condition involved the adult practicing what she preached: she demonstrated success and hard work while endorsing the value of hard work. In this sense, words have an additive value, enhancing children's inference from actions and outcomes when the

message is congruent with the behavior children observe.

The current findings are in line with previous work showing that children can learn the value of effort from adult models (Leonard et al., 2017; Zimmerman & Blotner, 1979). However, this work goes beyond previous studies both by examining behavior in preschool-age children, an age range previously not explored in this literature, by looking systematically at the influence of diverse kinds of testimony that adults use in talking about effort with children, and by looking at how children integrate testimony with observations of adult effort and outcomes.

Some previous work has suggested that preschool-age children may be overly optimistic about their abilities (e.g., Lockhart, Chang, & Story, 2002; Schneider, 1998), predicting that their own future performance will be high despite evidence of their own and their peers' past failures. In contrast to that work, we find that children use evidence of other people's success and failure to update the probability of their own success. Preschoolers understand that adults are more knowledgeable than they are (e.g., Lutz & Keil, 2002), so it makes sense that they might not bother trying if they see an adult fail at a task. However, we also note that all of the children spent at least some time trying to achieve the goal, even when they had just seen the adult try hard and fail. Thus, there is some evidence for children's optimism even within this study.

It is also interesting to consider the relationship of our findings to the literature on epistemic trust and selective social-learning (e.g., Koenig, Clément, & Harris, 2004; Poulin-Dubois & Brosseau-Liard, 2016). One possibility is that children failed to persist when the adult failed at the task because they perceived the adult as an incompetent or unreliable informant; in this case, children might have decided not to model their own behavior on the experimenter's (e.g., Brooker & Poulin-Dubois, 2013; Rakoczy, Warneken, & Tomasello, 2009). Intriguingly, in the Effort conditions, children also had evidence consistent with the possibility that the adult was not particularly competent at the task. However, insofar as the adult's eventual success led the children to try longer to accomplish the task themselves, children may have accrued evidence from their own difficulty opening the box that the issue lay not with the experimenter's ability but the difficulty of the task itself (see Gweon & Schulz, 2011 for other work on children's ability to distinguish whether a task is difficult because the agent can't do it or the toy doesn't work).

In this study, we found that telling the children the task was hard encouraged children to persist if and only if they had seen the adult succeed at the task. This finding is striking because one might have predicted that telling children something will be hard could lead them to give up. After all, adults perform worse on anagrams if they are labeled "hard" than "easy" (Scasserra, 2008) and 5th and 6th graders are less likely to choose tasks that are labeled "hard" than "easy" (Hom & Maxwell, 1983). However, here we find that, as long as children know the task is achievable, they step up to the challenge when they are told the task is hard. One possibility is that observing the adult outcome helped children estimate the difficulty of the task. If adults fail, this signals that the task may be impossibly hard for them, but if they succeed, it signals that the task is possible and may just require some additional effort. Thus, adult outcomes here may indicate that the task is within children's zone of proximal development (Vygotsky, 1978). This may be especially the case when, as in this study, the adult demonstrations occur within a pedagogical context where the adult uses ostensive cues to communicate her goals to the child (Csibra & Gergely, 2009; Gergely et al., 2002). In such contexts, children may extend a generalizable inference that the task is intended to be within their reach.

Across studies, children's persistence in the Success and Baseline conditions had high variance. This may arise from a number of factors, including stable individual differences in susceptibility to modeling, mindsets about the relationship between effort and outcome, differences in the child's estimate of their own self-efficacy with respect to the task, socioeconomic and cultural influences, as well as more transient factors such as the child's mood, fatigue, and opportunity costs with respect to other activities they could engage in (Belsky, Bakermans-Kranenburg, & van IJzendoorn, 2007; Dweck, 2006; Ellis, Boyce, Belsky, Bakermans-Kranenburg, & van Ijzendoorn, 2011; Evans, 2016; Evans, Gonnella, Marcynyszyn, Gentile, & Salpekar, 2005). We showed effects of adult models, outcomes, and testimony when randomizing across these factors, but future studies might look at how these factors interact with children's learning about effort from adult models and testimony.

In particular, cultural factors may play a role in children's learning from adult models of effort. In collectivist societies, children exhibit a higher level of imitative learning than children in individualist societies (Clegg & Legare, 2016). For example, in India, a collectivist society, adult modeling of

altruism has a greater influence on children's giving behavior than in the United States (Blake, Corbit, Callaghan, & Warneken, 2016). Adult modeling may also have more or less of an impact if it is aligned with cultural norms. Indeed, children imitate with higher fidelity if the demonstrator says that a task is conventional than if she says it is instrumental (Legare, Wen, Herrmann, & Whitehouse, 2015). Finally, children who grow up in societies where they are more involved in adult work or observational learning may develop different theories of effort from adult models than children growing up in industrialized western societies. How these cultural factors impact children's learning about effort is a rich area for future research.

Here we limited children's perceived complexity of the task using a fairly opaque toy that was not obviously too hard or too easy. However, differences in the surface features of the task indicating that it might be more or less difficult should also affect how hard children try and previous research suggests that children are sensitive to these factors (e.g., Gweon et al., 2017). We also assumed that children would treat adult models as more competent than themselves (Lutz & Keil, 2002); however, we did not directly assess children's perception of their own skill relative to the task or the adult model. Research suggests that adults will persist less if they see a model of similar competence fail on a task compared to observing failure by a less competent model (Brown & Inouye, 1978). Future research might manipulate the relative competence of the adult model to look at the degree to which children are sensitive to the difference in skill between them and the adult model when learning how hard to try.

Finally, because our measure of persistence was total time, here we captured children's persistent engagement with the task as a whole, rather than the degree to which they may have persistently focused on achieving the target goal (opening the box). This broad measure of engagement may have captured any number of behaviors (and thoughts) whose relevance to the goal is debatable. Children may, for instance, have spent some of their time daydreaming, or playing and exploring broadly without specifically trying to open the box. We did not exclude these here because (given an impossible task) it is not obvious which behaviors might or might not ultimately lead to task success. However, future research might develop tasks designed to distinguish focused persistence on a goal from thought, play, and exploration broadly. (Although we note that thought, play, and exploration broadly are likely to support children's learning, and may even lead to unexpected routes to achieving goals.)

Our results suggest that adults causally impact children's persistence with their actions, outcomes, and words. However, future work is needed to explore how adult models affect children's persistence over time, across contexts, and in relation to children's explicit theories of effort. Considering that perseverance has a very real-world impact on school achievement (Duckworth & Seligman, 2005; Eskreis-Winkler et al., 2014), future work should look at whether long-term exposure to adult statements of encouragement and the value of effort, in conjunction with modeling effortful success, increases children's persistence over time. However, at least in contexts when adults can ensure success, the current work suggests that if you want children to persist, you should practice what you preach.

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Supporting Information

Additional supporting information may be found in the online version of this article at the publisher's website:

Table S1. Number of Children Who Engaged in Each Action by Condition in Experiment 1

Appendix S1. Experiment 4 Additional Results