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PAPER

Preschoolers continue to trust a more accurate informant 1 week after exposure to accuracy information

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Abstract

To determine whether children retain a preference for a previously accurate informant only in the short term or for long-term use, 3- and 4-year-old children were tested in two experiments. In both experiments, children were given accuracy information about two informants and were subsequently tested for their selective trust in the two informants (Experiment 1: immediately, 1 day and 1 week later; Experiment 2: immediately, 4 days and 1 week later). Both age groups preferred to trust the accurate informant not only immediately after receiving accuracy information but also at subsequent time-points. Children who were immediately able to explicitly identify the accurate informant were significantly more likely to seek and accept information from her 1 week later. However, even when they had not been asked to explicitly identify the accurate informant both age groups still maintained their preference for her. Thus, by 3 years of age, children spontaneously choose a previously accurate informant up to 1 week after exposure to information regarding her accuracy.

Introduction

Several recent studies have demonstrated that preschoolers use a speaker's previous accuracy when determining whether to trust the speaker's current claims. When a speaker has previously labeled objects accurately, preschoolers prefer to accept novel labels from that speaker as compared to an inaccurate speaker. This selective trust has been demonstrated among 4-year-olds (Clément, Koenig & Harris, 2004; Koenig & Harris, 2005) and 3-year-olds (Jaswal & Neely, 2006; Koenig, Clément & Harris, 2004; Pasquini, Corriveau, Koenig & Harris, 2007), particularly when there are multiple cues to a given informant's credibility (Jaswal & Malone, 2007).

In these studies, children were asked to use accuracy information immediately in deciding whether to trust a particular speaker so that they may have simply held accuracy information in working memory. Thus, children may not have made stable evaluations of the individual informants, but simply used immediately prior information about their relative accuracy. When children are invited to use accuracy information over longer intervals, they may fail to retain that information.

Previous studies have suggested that preschoolers' memories for particular events decay relatively quickly. When Ornstein, Gordon and Larus (1992) interviewed 3- and 6-year-olds about a visit to the doctor, both age groups recalled much about the event immediately following the visit. However, whereas 6-year-olds' memory remained constant 1 and 3 weeks after the event, 3-year-olds' memory decayed. Nevertheless, several studies have indicated that 2–3-year-olds are able to recall events over a month-long delay when an event is particularly novel or salient (Fivush, Gray & Fromhoff, 1987; Hammond & Fivush, 1991) or when the memory has been discussed with a parent (Leichtman, Pillemer, Wang, Koreishi & Han, 2000).

Even if preschoolers are able to accurately recall prior accuracy, it is unclear whether they will use that information at later time-points. They might recall that the two informants differed in accuracy, but fail to regard that information as still relevant when deciding which informant to trust 1 day or 1 week after exposure to the accuracy information. Thus, preschoolers might regard accuracy and inaccuracy as a transient, situation-bound behavior rather than as a reflection of stable differences between informants that should guide their behavior toward them in the long-term. If preschoolers do view an informant as accurate over the long term such initial impressions should guide their behavior towards informants for extended periods of time.

To investigate children's memory for, and use of, accuracy information, we showed 3- and 4-year-old children videos in which one informant consistently labeled objects accurately and the other informant labeled objects inaccurately. Immediately following this accuracy information, we assessed children's preference for the two informants in test trials. We also tested children's preference for the two informants 1 day and 1 week later. If children remember the informants' differential accuracy

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and continue to make attributions on the basis of that memory, they should exhibit a preference towards the more accurate informant not just immediately but 1 day and even 1 week later.

Experiment 1

Method

Participants

Participants were 20 3-year-olds (M = 3;6, range: 3;0–3;11) and 24 4-year-olds (M = 4;7, range: 4;2–5;0). Children were recruited from preschools in Cambridge, MA and were primarily White, although a range of ethnicities and socioeconomic statuses was represented.

Procedure

All children were tested at three time-points. At Time 1 (Initial Testing), children received four *accuracy trials* in which one informant consistently labeled familiar objects correctly and the second informant labeled objects incorrectly. Children also received four *test trials* in which both informants provided novel labels for novel objects. Both at Time 2 (1 Day Later) and Time 3 (1 Week Later) children received four additional test trials.

Accuracy trials. A film featuring two female informants wearing different, solid-colored shirts and one male interviewer was used. To introduce the task, the experimenter pointed to a still frame and said, 'See these two people? This one's wearing a yellow shirt and this one's wearing a pink shirt. They're going to show you some things and tell you what they're called.'

Trials began with the male interviewer placing a familiar object between the two females and asking each of them, 'Can you tell me what this is called?' One informant labeled all four objects correctly, whereas the other informant labeled all objects incorrectly (e.g. called a *spoon* a *duck*). The correct informant was counterbalanced across participants in each age group. In each film, the order in which the informants were asked to label the familiar object alternated across the four trials.

Accuracy trials included two types of questions. *Name Checks* occurred after children heard the informants label each object. The experimenter paused the video and asked what the object was called (e.g. 'The girl in the pink shirt said it's a *brush* and the girl in the yellow shirt said it's a *plate*. What do you think it's called?'). Every child correctly named each object. Three *Explicit Judgment Questions* were asked after the fourth accuracy trial (i.e. just prior to the test trials). The experimenter pointed to a still frame and asked, 'Was the girl in the pink shirt very good or not very good at naming these things?' The same question was asked in reference to the informant in the yellow shirt. Question order varied across participants. Finally, the experimenter asked, 'Which girl was better at saying the names of these things?'

Test trials. Three films were used, one for each time-point. Each film featured the same two female informants and a male interviewer. Trials began with the male interviewer placing a novel object (e.g. a plastic sprinkler attachment) between the two female informants and asking one informant, 'Can you tell me what this is called?' The first informant responded with a novel label (e.g. 'That's a *roke*') and the same question was posed to the second informant who produced a different novel label (e.g. 'That's a *cham*'). In each film, the order in which the informants were asked to label the novel object alternated across the four trials.

Test trials included three types of questions: The four *Ask Questions* occurred prior to the viewing of each video clip. Children viewed a photograph of the novel object and the two informants and were asked, 'Do you know what this is called? I bet one of these people can help. Who would you like to ask, the girl with the pink shirt or the girl with the yellow shirt?' The four *Endorse Questions* occurred after each video clip. The experimenter paused the video and asked what the object was called (e.g. 'The girl in the pink shirt said it's a *roke* and the girl in the yellow shirt said it's a *cham*. What do you think it's called?'). Finally, children were asked three further *Explicit Judgment Questions* after the fourth test trial. This second set of *Explicit Judgment Questions* was identical to the first set asked at the end of the accuracy trials.

Results

We first report on children's performance on the test trials for each time-point in turn. Next, we compare performance across time-points. Finally, we examine the relationship between performance on the explicit judgment questions at Time 1 and performance on test trials.

Comparisons to chance for three question types at Time 1

Mean proportions for the ask, endorse, and explicit judgment questions at all time-points are displayed in Table 1. Scores on the *ask questions* represent the proportion of trials on which the child chose to ask the accurate informant. Both 3- and 4-year-olds performed above chance in choosing the accurate informant.

Scores on the *endorse questions* represent the proportion of trials on which the child chose the label provided by the accurate informant. Both 3- and 4-year-olds performed above chance in choosing the label given by the accurate informant.

Scores on the *explicit judgment questions* represent the proportion of correct answers. For both sets of explicit

Table 1 *Mean proportion correct (SD) on ask, endorse and explicit judgment (EJ) questions for 3- and 4-year-olds at Time 1, Time 2 (1 day later) and Time 3 (1 week later) in Experiment 1. Stars indicate comparisons to chance performance*

	3-year-olds (N = 20)		4-year-olds (N = 24)	
	Mean (*SD*)	*t*	Mean (*SD*)	*t*
Time 1				
EJ (before test trials)	.88 (.20)	8.76***	.97 (.14)	17.00***
Ask	.76 (.25)	4.70***	.84 (.21)	8.17***
Endorse	.78 (.23)	5.40***	.80 (.23)	6.36***
EJ (after test trials)	.73 (.34)	3.11**	.90 (.23)	8.58***
Time 2				
Ask	.74 (.28)	3.87**	.80 (.26)	5.80***
Endorse	.71 (.25)	3.85**	.83 (.25)	6.49***
EJ (after test trials)	.75 (.42)	3.14**	.75 (.42)	2.92**
Time 3				
Ask	.69 (.29)	2.91**	.80 (.22)	6.80***
Endorse	.67 (.24)	3.06**	.78 (.22)	6.13***
EJ (after test trials)	.68 (.27)	2.24*	.78 (.26)	3.92**
Totals				
Total Time 1	.79 (.15)	8.44***	.88 (.15)	12.45***
Total Time 2	.73 (.22)	4.79***	.80 (.26)	5.46***
Total Time 3	.68 (.24)	3.36**	.78 (.23)	6.07***

* $p < .05$; ** $p < .01$; *** $p < .001$.

judgment questions (before and after test trials), 3- and 4-year-olds performed above chance in identifying the accuracy of the informants.

In summary, both 3- and 4-year-olds performed above chance for all question types at Time 1. They successfully identified the accuracy of the informants and used this information both to decide whom to ask for information and which novel label to accept.

Comparisons to chance for three question types at Time 2 (1 day later)

Both 3- and 4-year-olds were above chance for all three question types. Thus, 1 day after receiving accuracy information both 3- and 4-year-olds were still able to identify the more accurate of the two informants and they used this information to decide whom to ask and whose label to endorse.

Comparisons to chance for three question types at Time 3 (1 week later)

Again, both 3- and 4-year-olds were above chance for all three types of questions. Thus, 1 week after receiving accuracy information both age groups continued to be selective in their trust.

Bonferroni adjustments

Children's scores for the overall proportion correct (collapsed across question type) are shown in Table 1 as a function of Age and time-point. Because multiple *t*-tests had been conducted, we also examined the Total scores with Bonferroni adjustments to alpha ($\alpha/6$). Total scores remained significant at the $p < .001$ level, with the exception of Time 3 for the 3-year-olds (significant at the $p < .05$ level).

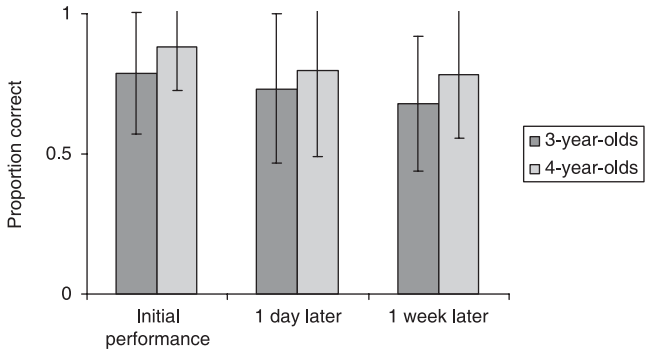

Figure 1 *Overall proportion of times children chose the more accurate informant in the ask, endorse, and explicit judgment questions by age group and time-point in Experiment 1.*

Overall performance

To assess overall performance, a three-way ANOVA with age group (3, 4) as the between-subjects variable and time-point (Time 1, Time 2, Time 3) and question type (explicit judgment, ask, endorse) as within-subjects variables was calculated. To permit comparisons across time-points, we averaged children's scores on the two sets of Explicit Judgment Questions for Time 1. (Recall that children received two sets of Explicit Judgment Questions at Time 1, but only one set at Times 2 and 3.) This analysis produced a main effect of time-point ($F(2, 84) = 4.71$, $p < .01$, $\eta^2 = .10$), revealing that selection of the accurate informant decreased over time. The effect of age group was not significant ($F(1, 42) = 2.10$, $p = .155$). No other main effects or interactions were found. Overall performance is illustrated in Figure 1.

The results of the ANOVA confirmed the conclusions that emerged when children's performance was compared to chance. No difference in performance was found between 3- and 4-year-olds, because all children consistently identified and trusted the accurate informant. Nevertheless, overall selection of the accurate informant decreased slightly over time.

Relationship between explicit judgment and overall performance

Koenig, Clément and Harris (2004) found a relationship between children's ability to explicitly identify the more accurate informant and their preference for her. To investigate whether initial explicit judgment performance was associated with overall performance at each of the

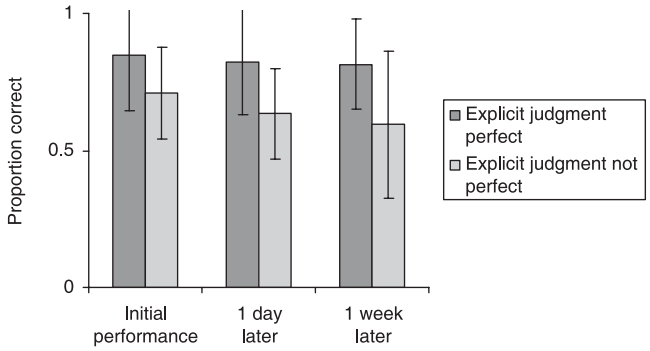

Figure 2 *Overall proportion of times children chose the more accurate informant in the ask and endorse questions by explicit judgment performance at each time-point in Experiment 1.*

time-points a four-way ANOVA with total explicit judgment performance at Time 1 (perfect, not perfect) and age (3, 4) as the between-subjects variables and time-point (Time 1, Time 2, Time 3) and question type (ask, endorse) as within-subjects variables was conducted. This ANOVA revealed a main effect of Explicit Judgment performance ($F(1, 40) = 11.01$, $p < .01$, $\eta^2 = .22$) and a trend for time-point ($F(2, 80) = 2.09$, $p = .10$, $\eta^2 = .19$). Children who were able to perfectly identify the accuracy of the informants at Time 1 showed greater selectivity than children who were unable to perfectly identify the accuracy of the informants. No other main effects or interactions were found. This effect of explicit judgment performance is shown in Figure 2. As a further check, we examined the relationship between explicit judgment scores and ask/endorse scores with three linear regressions (one for each time-point) instead of a four-way ANOVA. As expected, we obtained a significant relationship between EJ and ask/endorse scores at every time-point (R^2s > .21).

Discussion

Experiment 1 examined children's preference for a previously accurate informant immediately, 1 day and 1 week after accuracy information was provided. We asked if trust in a previously accurate informant is maintained in the absence of any additional accuracy cues at those later time-points. Both age groups preferred the previously accurate informant at all three time-points although there was a modest decline in the strength of this preference over time. Regardless of age, preference for the accurate informant 1 week after exposure to accuracy information was related to ability to explicitly identify the accurate informant at initial testing.

Experiment 2

The results of Experiment 1 suggest that both 3- and 4-year-olds retain their preference for an accurate informant up to 1 week after exposure to accuracy information. The ability to explicitly differentiate between the two informants immediately after the accuracy trials was strongly associated with performance 1 day and 1 week later. These results help to clarify the pattern of findings reported in earlier studies of selective trust. Given that children were tested immediately after receiving accuracy information, it is possible that their choices were based on information in short-term memory, information that would have little effect on subsequent encounters with the informants. Experiment 1 shows, however, that information about the relative accuracy of the informants was encoded in long-term memory. Moreover, the better that encoding reflected the difference between the two informants as indexed by replies to the explicit judgment questions at Time 1, the greater the selective trust shown at later time points.

However, children received explicit judgment questions during every testing session. These questions may have enhanced children's tendency to retrieve and use their identification of the accurate informant. Indeed, it is conceivable that selective trust is shown by preschoolers only when they are given such cues. This possibility was examined in Experiment 2. The explicit judgment questions were removed from the procedure during initial and interim testing and asked only at the end of the final testing session. We again tested 3- and 4-year-olds, each divided into two sub-groups. Both sub-groups initially received accuracy information; one subgroup was subsequently tested 4 days later and the other was tested 1 week later.

Method

Participants

Participants were 20 3-year-olds ($M = 3;6$, $SD = 3$ months, range: 3;1–4;0) and 22 4-year-olds ($M = 4;7$, $SD = 3$ months, range: 4;2–5;0). Children were recruited from preschools in Cambridge and Brookline, MA and were primarily White, although a range of ethnicities and socioeconomic statuses were represented.

Procedure

All children were tested at two time-points. Twenty-one children (10 3-year-olds) were tested initially and then again 4 days later. The remaining 21 children (10 3-year-olds) were tested initially and 1 week later. As in Experiment 1, at Time 1 (Initial Testing), children received four *accuracy trials* in which one informant consistently labeled four familiar objects accurately and the other informant labeled objects inaccurately and four *test trials* in which the two informants labeled novel objects. Note that at Time 1 only the *Ask* and *Endorse questions* were posed to the children. Thus, children received no Explicit Judgment Questions at Time 1. At Time 2 (4 days or 1 week later depending on the sub-group) four additional

Table 2 *Mean proportion correct (SD) on ask, endorse and explicit judgment questions for 3- and 4-year-olds by delay condition (4 days later, 1 week later) in Experiment 2. Stars indicate comparisons to chance performance*

	3-year-olds		4-year-olds	
	Mean (*SD*)	*t*	Mean (*SD*)	*t*
4 day delay condition				
Initial testing	*N* = 10		*N* = 11	
Ask	.80 (.22)	4.12**	.80 (.25)	3.99**
Endorse	.75 (.12)	6.71***	.82 (.11)	9.04***
4 day delay				
Ask	.75 (.17)	4.74***	.82 (.20)	5.51***
Endorse	.81 (.16)	6.16***	.83 (.16)	6.74***
Explicit Judgment	.85 (.22)	4.88***	.76 (.16)	7.48***
Total initial testing	.78 (.13)	6.74***	.81 (.10)	9.93***
Total 4 day delay	.80 (.16)	5.84***	.84 (.13)	8.65***
1 week delay condition				
Initial testing	*N* = 10		*N* = 11	
Ask	.78 (.14)	6.13***	.82 (.19)	5.37***
Endorse	.75 (.17)	3.06***	.88 (.13)	9.81***
1 week delay				
Ask	.65 (.13)	3.67**	.75 (.16)	5.24***
Endorse	.70 (.11)	6.00***	.80 (.16)	6.50***
Explicit Judgment	.73 (.21)	3.50**	.76 (.26)	3.26**
Total initial testing	.76 (.09)	9.00***	.85 (.13)	8.67***
Total 1 week delay	.69 (.09)	6.39***	.77 (.18)	5.05***

** $p < .01$; *** $p < .001$.

test trials were administered that included *Explicit Judgment* questions as well as *Ask* and *Endorse* questions. These *Explicit Judgment* questions were posed after the final *Endorse* question. The same films from Experiment 1 were used in Experiment 2 (see Tables 1 and 2).

Results

We first report on children's performance on the test trials for each of the three time-points, respectively. Next, we compare performance across the three time-points.

Comparisons to chance for three question types at Time 1

Mean proportions for the Ask, Endorse, and Explicit Judgment Questions for the 4 days and 1 week delay groups are displayed in Table 2. Both 3- and 4-year-olds performed above chance for all question types. They successfully identified the accuracy of the informants and used this information both to decide whom to ask for information and which novel label to accept.

Comparisons to chance for three question types after 4 days or 1 week delay

Both 3- and 4-year-olds were above chance for all three question types. Thus, both 4 days and 1 week after receiving accuracy information children were still able to identify the accurate informant and used this information to decide whom to ask and whose label to endorse.

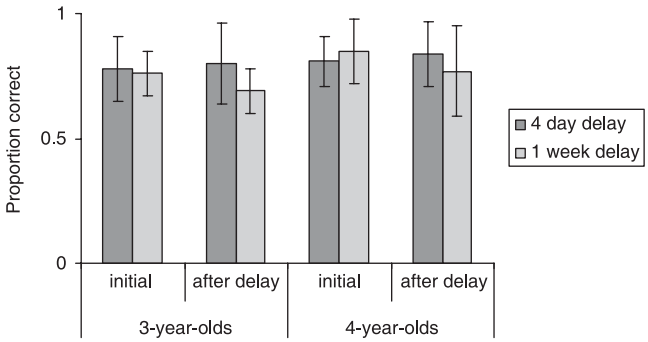

Figure 3 *Overall proportion of times children chose the more accurate informant in the ask, endorse, and explicit judgment questions by age group and time-point in Experiment 2.*

Bonferroni adjustments

As in Experiment 1, we examined the Total scores with Bonferroni adjustments to alpha ($\alpha/8$). Even with this adjustment, all Total scores were significant at the $p < .001$ level.

Overall performance

In order to assess overall performance, a three-way ANOVA with age group (3, 4) and delay length (4 Day Delay, 1 Week Delay) as the between-subjects variables and time-point (Time 1, Time 2) as the within-subjects variable was calculated. This analysis revealed a trend for a main effect of age group ($F(1, 38) = 3.52$, $p = .08$, $\eta^2 = .09$), with 4-year-olds demonstrating a marginally stronger preference for the previously accurate informant than 3-year-olds. In addition, a Delay Length × Time-point interaction emerged ($F(1, 76) = 3.92$, $p < .05$, $\eta^2 = .09$). No other main effects or interactions were found. Overall performance is illustrated in Figure 3.

To further explore the Delay Length × Time-point interaction, the simple effect of Delay Length was calculated. As expected, we found no difference in the delay length groups at initial testing ($F(1, 76) = .16$, *ns*). However, there was a difference between the groups at the second test session (4 days versus 1 week later: $F(1, 76) = 4.86$, $p < .05$). Children's preference for the previously accurate informant was stronger after a delay of 4 days as compared to a delay of 1 week.

In summary, both 3- and 4-year-olds selectively identified and trusted the more accurate informant – 4 days and even 1 week after accuracy information had been provided. The preference for the accurate informant was slightly stronger in the 4-year-old group. Overall preference for the more accurate informant was weaker at the longer delay interval of 1 week.

General discussion

Taken together, the results of Experiments 1 and 2 are compelling for two reasons. First, preschoolers' selective

trust appears to be triggered by minimal exposure to accuracy information. Second, that selective trust remains stable even in the absence of reminders or prompts. We consider each point in turn.

Evidence from attachment theory has shown that young children monitor the sensitivity of a caregiver and adjust their approach to him or her accordingly (Ainsworth, Blehar, Waters & Wall, 1978; van IJzendoorn, Juffer & Duyvesteyn, 1995). However, this type of selective responding is generally regarded as emerging over several days or weeks of interaction. By contrast, the selective trust observed in the present study was the result of a brief exposure to differential accuracy lasting only 2 minutes. Thus, young children adjust their epistemic trust in an informant on the basis of minimal accuracy information. In future experiments, it should be possible to establish just how minimal that information can be. Conceivably, a single inaccuracy might be sufficient to trigger subsequent mistrust. Pasquini *et al.* (2007) report evidence suggesting that possibility: although 3-year-olds preferred an accurate over and an inaccurate informant, they no longer did so if the accurate informant made a single error.

Not only did children require minimal exposure to the differential accuracy of the two informants, they retained and used that information in a relatively stable fashion. Thus, in both age groups selectivity was evident after 1 week even though the absolute strength of that selectivity was less marked than on initial testing. Note that children were given no further exposure to informants' relative accuracy during the 1-week delay and in Experiment 2 they were not questioned about informants' relative accuracy until the end of the experiment. The critical impact of initial accuracy information was highlighted by analysis of children's explicit judgment scores. Children's replies to the explicit judgment questions during initial testing predicted the strength of their selective trust 1 week later, suggesting that children not only formed a rapid initial impression of the two informants, but also continued to rely on that initial impression. Preschoolers' ability to spontaneously form such initial impressions is particularly striking given the context of the experiment. Although they received no explanation of why the inaccurate informant was making mistakes, children quickly viewed her as inaccurate.

Recent research with adults suggests that such brief initial impressions (as brief as 2 seconds exposure) are subsequently retrieved in a relatively automatic fashion. Thus, on re-exposure to individuals previously associated with distinctive behaviors, adults retrieve that information even when making other, distinct judgments about that individual (Todorov, Gobbini, Evans & Haxby, 2007; Todorov & Ullman, 2002, 2003). In future research, it will be interesting to determine both how little exposure is necessary for young children to form a lasting impression about an informant and whether they are prone to the same type of automatic retrieval. The robust displays of selective trust observed in the present study suggest that in this respect there may be important continuities between early childhood and adulthood.

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