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PAPER

Identifying unreliable informants: do children excuse past inaccuracy?

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Abstract

In three experiments (N = 123; 148; 28), children observed a video in which two speakers offered alternative labels for unfamiliar objects. In Experiment 1, 3- to 5-year-olds endorsed the label given by a speaker who had previously labeled familiar objects accurately, rather than that given by a speaker with a history of inaccurate labeling, even when the inaccurate speaker erred only while blindfolded. In Experiments 2 and 3, 3- to 7-year-olds showed no preference for the label given by a previously inaccurate but blindfolded speaker, over that given by a second inaccurate speaker with no obvious excuse for erring. Children based their endorsements on speakers' history of accuracy or inaccuracy irrespective of the speakers' information access at the time, raising doubts that children made mentalistic interpretations of speakers' inaccuracy.

Introduction

Both children and adults rely on others to provide information about the social and physical world. Even well-intentioned speakers can be wrong, and so a critical task for the listener is to decide when to accept a piece of new information, and when to discard it as probably inaccurate. Without this ability, we run the risk of accepting false information as true. How do children tackle this challenge?

One source of information about whether a speaker is giving accurate information is that speaker's history of accuracy or inaccuracy, and several researchers have demonstrated children's sensitivity to this variable (Birch, Vauthier & Bloom, 2007; Brousseau-Liard & Birch, 2007; Jaswal, McKercher & Vanderborgh, 2008; Jaswal & Neely, 2007; Koenig, Clément & Harris, 2004; Koenig & Harris, 2005; Koenig & Woodward, 2007). In these studies, children typically observe a video in which two adult speakers name familiar objects, although in some studies dolls or pictured adults have been used as speakers. One speaker consistently names the objects correctly (e.g. 'it's a ball') while the other consistently names them incorrectly (e.g. 'it's a dog'). In this way, one speaker builds a history of accuracy, and the other of inaccuracy. At test, children observe as the two speakers offer conflicting novel labels for an unfamiliar object (e.g. 'it's a fendle', 'it's a blicket'), or give the same novel label to two different unfamiliar objects. Four-year-olds, and sometimes 3-year-olds, consistently endorse the label provided by the speaker with a history of accurate naming. Children at both ages are also sensitive to an

explicit declaration of ignorance, endorsing the label provided by a speaker with a history of correct naming over one provided by a speaker who claimed ignorance about the labels of the familiar objects (Koenig & Harris, 2005; Sabbagh & Baldwin, 2001).

Although results using this procedure consistently show that children use speakers' histories of relative accuracy to determine from which speaker to accept new information, it remains unclear exactly what children learn during the history phase of the procedure. Birch *et al.* (2007) point out that the results can be interpreted in different ways. One is that children make mentalistic interpretations, inferring that the accurate and inaccurate speakers differ in their knowledge about the domain in question. The other is that children generalize simply on the basis of the speakers' outputs, just as they could if listening to speaking clocks, for example, one of which had a history of telling the time accurately and the other inaccurately. Listeners could learn to 'distrust' the inaccurate clock without making inferences about its internal workings. Birch *et al.*, while admitting that the evidence remains unclear, lean towards the mentalistic interpretation, citing other evidence that young children seem to make mentalistic interpretations of speakers' output. For example, they treat a human speaker who mislabels a familiar object differently from an audio-speaker (Koenig & Echols, 2003).

Similarly, Harris and colleagues argue for a mentalistic interpretation of children's inclination to learn from a previously accurate speaker in preference to a previously inaccurate one. Harris and colleagues interpret their findings in terms of 'selective trust', and by this they

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mean something more than the kind of trust we might show in a reliable clock. For example, Harris (2007) states, '... selective trust almost certainly calls for different mental attributions to the two informants' (p. 137). To date there is no convincing evidence to justify this assertion.

A strong test of whether or not children apply mentalistic reasoning to predict speakers' future reliability is to find out whether or not they take into account the speaker's input to interpret the significance of inaccurate output. We made such a test in the present research. Children observed a speaker who was poorly informed through wearing a blindfold, and thus had good reason for making errors. Children were told explicitly that the blindfolded speaker could not see. At test, the blindfold was removed, and children were probed to determine whether they excused the inaccurate speaker and endorsed her subsequently presented label. If they did, this would provide strong evidence that mentalistic reasoning is involved when children make predictions about speakers' reliability.

Experiment 1

We compared the performance of children in two groups. One group received history trials like those used by previous researchers, in which two speakers provided conflicting labels for familiar objects. Over three trials, one speaker was consistently correct, and the other was consistently incorrect for no obvious reason. For children in the second group, the inaccurate speaker wore a blindfold during the naming of familiar objects. All children then had identical test trials with both speakers able to see: The previously inaccurate speaker and the previously accurate speaker provided conflicting novel names for a novel object, and children were asked to endorse one or the other speaker's label.

Children in the first condition should selectively endorse the previously accurate speaker's label, consistent with the published findings. In contrast, in the blindfold condition, if children considered the reasons for the speaker's error, they would show no preference for either speaker. Once the blindfold has been removed, the unreliable speaker no longer has any reason to err, so should be able to provide an accurate label. On the other hand, if children make judgments based on speakers' output only, irrespective of the circumstances, then there would be no difference between the two conditions and children would again endorse the label given by the previously accurate speaker.

For children to excuse the blindfolded speaker, they must understand how the blindfold limits the speaker's view. This understanding appears to be in place by 18 months of age, and possibly as young as 12 months: Infants follow the gaze of an actor less often if the actor is wearing a blindfold than if the actor can see (e.g. Brooks & Meltzoff, 2002; D'Entremont & Morgan, 2006). As the youngest participants in Experiment 1 were over the age of 3 years, it was expected that all participants would

have the necessary understanding of blindfolds. As an additional precaution, when the experimenter drew the child's attention to the speaker's blindfold, she stated explicitly that the blindfolded speaker could not see: Children were not required to make that inference for themselves.

Importantly, in our procedure the blindfolded speaker could not be considered irresponsible for making a guess about the identity of an unseen object: The rules of the game demanded that both speakers took turns to say what they thought the object was, whether or not they could see.

Method

Participants

In total 123 children participated. Seventy-two children (34 girls) attended nursery classes ($M = 3;11$, range 3;3 to 4;5) and 51 (22 girls) were in reception, their first year of formal schooling ($M = 4;9$, range 4;3 to 5;4). All children in this and subsequent experiments attended schools serving predominantly white working- and middle-class areas of Warwickshire and the West Midlands regions of the UK.

Materials

Five video clips were created, corresponding to three history trials and two test trials. Each clip showed the experimenter (Nurmsoo) place an object on the table between two actors. On history trials, these objects were familiar: A cup (labeled as a cup and a dog), a book (labeled as a book and a chair), and a shoe (labeled as a shoe and a ball). On test trials, the objects were unfamiliar: A white and red hinged object (labeled as a grimmel and a terber), and a blue plastic object made of multiple tubes (labeled as a blicket and a fendle). A scarf was used as a blindfold. The objects in the clips were presented to children alongside the video.

Design and procedure

Children received first a Warm up, followed by three History trials and two Test trials. Participants were randomly assigned to either the Seeing or Blindfold conditions, which differed in the History trials: In the Blindfold condition, the consistently inaccurate speaker wore a blindfold while naming the familiar objects, while in the Seeing condition, no blindfold was used.

In the *Warm up*, the experimenter introduced the task, and showed children the objects used as props, without naming them. Children were shown that the scarf could be used as a blindfold, and were invited to try it on. The experimenter drew children's attention to both speakers, and for children in the Blindfold condition only, explicitly stated that the blindfolded speaker could not see.

In the *History trials*, all children observed two speakers providing conflicting labels for three familiar objects. In

the Blindfold condition, the inaccurate speaker wore the scarf as a blindfold. Apart from this, the history trials in the two conditions were identical. All video clips showed the experimenter first placing a familiar object on the table. The correspondence between the object on video and its real counterpart was explicitly mentioned. On the video, the experimenter turned to each speaker in turn and asked, 'What do *you* think this is?' Each speaker replied, for example, 'I think it's a book/chair'. This phrasing of questions and responses allowed the blindfolded speaker to behave in a reasonable manner within the constraints of the game, but without the inaccurate speaker in either condition explicitly expressing uncertainty. In all cases, children were asked to repeat what each of the speakers had said, and what the object was really called. If children did not recall accurately, the video was played up to two more times, as required.

The inaccurate speaker (male or female) was counterbalanced between participants, and was not shown on the same side of the screen on sequential trials.

The two *Test trials* had the same structure as the History trials: The experimenter on video placed a novel object on the table, children's attention was explicitly drawn to the correspondence between the object on video and its real counterpart, and the two speakers provided conflicting labels. For children in both conditions, neither speaker now wore a blindfold. For children in the Seeing condition, this was no different from the History trials. For children in the Blindfold condition, however, this change was explicitly mentioned: 'Look, s/he's not wearing the scarf over her/his eyes any more!'

Children were asked to repeat both words as on the History trials, and once they did this successfully, the experimenter said, for example, 'He called it a blicket, and she called it a fendle. So what is it? Is it a blicket, or a fendle?' The order of novel words used in this forced-choice test question corresponded to the order in which they were heard on the video. Both the order of presentation of the two novel objects and the label used by the inaccurate speaker were counterbalanced.

At the end of the experiment, children were given a *Memory check*. They were asked, 'One of these two people kept saying the wrong thing! Who kept saying the wrong thing?' followed by an open ended 'How come?' Only children who correctly identified the inaccurate speaker were included in the final analysis. Eight nursery and three reception children were excluded on these grounds.

Results and discussion

On each of the two test trials, children received a point if they endorsed the word provided by the previously accurate speaker. Results are summarized in Table 1. All comparisons to chance were calculated against the chance distribution.

In the Seeing condition, children in both the 3- to 4- and the 4- to 5-year-old groups endorsed the word used by the previously accurate speaker at a rate above chance, $\chi^2(2, N = 32) = 6.75, p < .04$ and $\chi^2(2, N = 24) = 15.6, p < .001$, respectively. As in previous research (Birch *et al.*, 2007; Jaswal & Neely, 2007; Koenig *et al.*, 2004; Koenig & Harris, 2005), children were sensitive to the speakers' history of accuracy or inaccuracy and preferred to learn from the previously accurate speaker.

In the Blindfold condition, if children considered the reasons for the inaccurate speaker's errors, they should be more likely than those in the Seeing condition to endorse the inaccurate speaker's word for the novel object. However, in the 4- to 5-year-old group, children still preferentially endorsed the word used by the accurate speaker at a rate above chance, $\chi^2(2, N = 24) = 6.0, p < .05$. Children in the 3- to 4-year-old group were no different from chance, $\chi^2(2, N = 32) = 1.69, ns$. Importantly, children performed no differently in the Blindfold than in the Seeing condition in either the younger group, $t(62) = 1.42, ns$, or older group, $t(46) = 1.11, ns$. There was no evidence that children took into account the circumstances explaining the unreliable speaker's errors. Instead, children appeared to rely solely on the speakers' history of accuracy or inaccuracy.

Despite failing to consider the speaker's blindfold in their endorsement of the new word labels, children did understand how the blindfold affected the speaker's familiar object naming. When asked why the inaccurate speaker made errors in naming familiar objects, children in the Blindfold condition spontaneously cited the blindfold: Of children who provided a response to this final question, 75% of 24 4- to 5-year-old children and 43% of 28 3- to 4-year-old children referred to the blindfold or to the fact that the inaccurate speaker could not see.

In contrast, children in the Seeing condition, who were given no obvious reason for the inaccurate speaker's errors, often had no spontaneous response. The remaining children provided various answers (e.g. 'because she wasn't allowed to say it'; 'because he was being funny').

Table 1 Experiment 1: Frequency of endorsement of previously accurate speaker's label over two trials, by age and condition

Age group	Condition	Number of times previously accurate speaker's label endorsed			Mean (SD)
		0	1	2	
Nursery 3–4 years	Seeing	2	18	12	1.31 (0.59)
	Blindfold	5	19	8	1.09 (0.64)
Reception 4–5 years	Seeing	1	9	14	1.54 (0.59)
	Blindfold	3	10	11	1.33 (0.70)

None of the children in the Seeing condition cited a failure to see the object as a possible reason for the speaker's error.

These findings suggest that when children used a speaker's history of accuracy, they did not reason about how his or her input might be affecting the accuracy of the output. Rather, children appeared to consider only the speaker's output. An alternative possibility, however, is that in the Blindfold condition there was no good reason to rely on the previously inaccurate speaker, whose reliability was unknown, given the positive evidence that the accurate speaker was reliable. We explore this possibility in Experiment 2.

Experiment 2

Children entered a single condition similar to the Blindfold condition of Experiment 1, except that the accurate speaker was replaced by a second inaccurate speaker who had no obvious reason for erring. On test trials children had to choose whether to endorse the novel label given by a previously inaccurate speaker with no excuse, or a previously inaccurate speaker who had been wearing a blindfold. We also included an older group of children, about whom there could be no doubt that they understood clearly how the blindfold would impact the inaccurate speaker's ability to correctly report the identity of the target objects.

Method

Participants

A total of 148 children participated. Fifty-six children attended nursery classes ($M = 3;11$, range 3;6 to 4;5; 29 girls), 48 were in reception, their first year of formal schooling ($M = 5;0$, range 4;6 to 5;5; 23 girls), and 44 were in year 2, their third year of formal schooling ($M = 7;0$, range 6;4 to 7;7; 21 girls).

Materials

Five video clips were created, following the structure of the clips used in Experiment 1 but using two new actors, one male and one female, and different familiar objects: A ball (labeled as a mug and a plate), a hat (labeled as a shoe and a glove), and a spoon (labeled as a pencil and a paintbrush).

Procedure

The procedure and counterbalancing followed that of the Blindfold condition in Experiment 1, with the exception that both speakers provided incorrect labels for the familiar objects. On test trials, neither speaker was blindfolded, and children's attention was drawn to this change in the same way as in Experiment 1. There was no final memory check question for the two younger

Table 2 Experiment 2: Frequency of endorsement of previously blindfolded speaker's label over two trials, by age and condition

Age group	Number of times child endorsed label from previously blindfolded speaker		
	0	1	2
Nursery, 3–4 yrs	10	36	10
Reception, 4–5 yrs	10	28	10
Year 2, 6–7 yrs	10	21	13

groups of children, but the oldest group was asked why each of the two speakers erred.

Results and discussion

On each of the two test trials, children received a point if they endorsed the word provided by the previously blindfolded speaker. Results are summarized in Table 2.

If children excused the previously blindfolded speaker's errors, they should preferentially endorse his or her labels. However, performance by all age groups was no different from the chance distribution, $\chi^2(2, N = 56) = 4.57$, for 3- to 4-year-olds, $\chi^2(2, N = 48) = 1.33$, for 4- to 5-year-olds, and $\chi^2(2, N = 44) = 0.50$, for 6- to 7-year-olds, all non-significant. Children did not consider the circumstances explaining the inaccurate speaker's errors, but instead relied solely on the speakers' history of inaccuracy. Incidentally, had children 'stigmatized' the previously blindfolded speaker, they would have shown a preference for the other speaker on test trials. There was no sign of this.

The oldest group of children frequently explained the speaker's errors with reference to the blindfold: 82% of children cited the inability to see as the reason for the errors, while the remaining children provided unclassifiable responses (e.g. 'She didn't know the right answers').

In the final experiment we considered one further possible explanation: The blindfolded speaker was of unknown reliability. Perhaps children needed positive evidence that the blindfolded speaker was accurate when not wearing the blindfold.¹

Experiment 3

In Experiment 3, children watched the same video as in Experiment 2, with an opening scene showing both speakers providing correct information when not wearing a blindfold. One speaker then donned a blindfold and understandably made errors naming familiar objects, while the other inexplicably named the familiar objects inaccurately. In the initial scene, we established both speakers' accuracy in a related domain: The function of a familiar object. Previous research into the influence of

¹ We are grateful to Patricia Brosseau-Liard for suggesting this manipulation.

speakers' history on listeners' subsequent learning from them has confirmed that children generalize between functions and object names in both directions from speaker's history (Birch *et al.*, 2007; Koenig & Harris, 2005).

Method

Participants

A total of 28 children participated (14 girls, $M = 5;3$, range 4;7 to 5;8).

Materials and procedure

The procedure of Experiment 2 was used, with an initial clip added before the history trials showing the experimenter placing a book on the table, and asking each of the speakers in turn, 'What do you think this is for?' Both speakers replied, 'I think it's for reading.' The history trials and the rest of the procedure were identical to those in Experiment 2.

Results and discussion

Six children endorsed the previously blindfolded speaker on both trials, five never endorsed the previously blindfolded speaker, and the remaining 17 children used the blindfolded speaker's word once out of the two trials. As in Experiment 2, performance was no different from the chance distribution, $\chi^2(2, N = 28) = 1.36, p = .51$, showing no preference for the label offered by the previously blindfolded speaker. The results of Experiment 2 seem not to be due to children's lack of evidence about the blindfolded speaker's accuracy when not blindfolded.

As before, children did understand how the blindfold explained the blindfolded speaker's errors: of the 24 children who provided spontaneous responses, 83% cited the inability to see as the reason for the blindfolded speaker's errors, while 17% provided unclassifiable responses (e.g. 'he thought that round thing was a brush').

General discussion and conclusions

We confirmed previous findings (Birch *et al.*, 2007; Jaswal & Neely, 2007; Koenig *et al.*, 2004; Koenig & Harris, 2005) that children take into account a speaker's past history of accuracy, endorsing the label given by a previously accurate speaker over one given by a previously inaccurate speaker when there was no obvious circumstantial explanation for the inaccuracy (Experiment 1). Children showed the selective trust in previously accurate speakers as in the published literature. Our interest was in whether this behavior reflects attention to the speaker's output alone, or if children consider *why* the speaker was inaccurate. We found no evidence that they do.

In Experiment 1, children were no less likely to endorse the label offered by a previously accurate speaker when

the inaccurate speaker was blindfolded at the time of making errors than when there was no obvious circumstantial excuse. In Experiments 2 and 3, when both speakers were inaccurate, children still failed to show any preference for the one whose previous inaccuracy could be excused in terms of inadequate information (nor any preference for the speaker who had been able to see throughout). Failure to excuse inaccuracies that occurred while blindfolded occurred even when the speaker had proved accurate before donning the blindfold (Experiment 3). The results of all three experiments suggest that children attended only to accuracy of past output when predicting a speaker's likely future reliability. Despite this, when asked to explain the blindfolded speaker's inaccuracy, children often cited his or her inability to see, suggesting that they were sensitive to the blindfolded speaker's input conditions when explaining his or her output errors.

We consider three possible explanations. One is that children of the ages we tested do not make mentalistic interpretations of speakers' accuracy or inaccuracy, despite understanding that inaccuracy can occur if the speaker is blindfolded. Perhaps explaining why inaccuracy occurred and predicting future reliability draw on different processes, and children do not integrate the two to see the implications of one for the other. Predictions about longer term reliability are based only on output, while explanations for current inaccuracies draw on relevant input or lack of it. Such disjointed reasoning is plausible for 3- and 4-year-olds with limited information processing capacity: They would err on the side of caution by avoiding learning from a previously inaccurate speaker irrespective of circumstances, or from a currently poorly informed one. In each case, they need attend to only one variable, either input or output, rather than both. Such an account is less plausible for 6- to 7-year-olds, however: These older children, who should be well practiced in mental state reasoning, did not excuse the blindfolded speaker.

A second, more plausible, possibility is that children of the ages we tested can make mentalistic interpretations of speakers' accuracy or inaccuracy, but fail to do so in the typical procedure used in our studies reported above and in the published research. Importantly, in research using different procedures, 3- and 4-year-olds did excuse a speaker's past inaccuracy when it was explained by limited information access (Nurmsoo & Robinson, 2007, March, 2007, October). This evidence also argues against the first possibility considered above. For example, in one procedure (Nurmsoo & Robinson, 2007, March), children aimed to identify a hidden toy in collaboration with an informant. Three- and 4-year-olds tended to ignore a currently well-informed informant who was previously inaccurate despite having full information, consistent with Experiment 1 above and the published studies on selective trust (e.g. Koenig & Harris, 2005). However, contrary to our findings above, children did believe a currently well-informed informant whose past

inaccuracies arose from inadequate information access, for example because she had only felt a toy and then misidentified its color. It seems, then, that young children can take into account an informant's relevant input when deciding whether or not to excuse past inaccuracies. Why did they apparently fail to do so in the three experiments reported above?

Communicative and social cues necessary to engage mentalistic reasoning may be missing from the typical task, or the absence of such cues may direct children not to engage mentalistic reasoning. What might such cues be? Csibra and Gergely (2005) argue that when adults intend to pass on to children generalizable semantic knowledge such as the names or functions of objects, they provide clear cues that they are about to engage in such pedagogic communication, by making eye contact with the potential learner and establishing joint reference to the teaching context. Young children, they argue, are particularly sensitive to such cues. We might infer, then, that they are particularly thrown when the expected cues do not occur, as they do not in the procedure typically used in the published studies. Although Csibra and Gergely do not consider situations involving more than one adult, the expectation might be that onlookers would react to errors with surprise, correct them, or in some other way indicate to the child listener that false information had been conveyed by a speaker who was apparently fully informed. Yet in the typical video procedure, the inaccurate speakers' errors pass without reaction from the other adults. Under these socially odd circumstances, when people behave mechanically, perhaps children focus only on accuracy of output to predict future output, just as they could for a machine.

The implication is, then, that the typical manner in which a speaker is rendered unreliable, or untrustworthy, in the published literature leads children to make generalizations based on accuracy of speakers' output only. In these procedures, mistrust occurs whether speakers' inaccuracy arises from longer term, cross-situational unreliability, or is due to temporary circumstances that no longer hold.

The third possibility, also plausible, and perhaps the most interesting, is that the discrepancy in results between our Experiments 1, 2 and 3, along with the published studies such as Koenig and Harris (2005), and the work of Nurmsoo and Robinson summarized above, is due not to the differences in communicative cues between the two procedures, but rather to the content of the information being conveyed. Perhaps children are particularly cautious when they are offered generalizable, semantic knowledge such as the names or functions of novel objects (as in the published studies and in our Experiments 1, 2, and 3), but less cautious when they are offered epistemic knowledge such as which object happens to be in a container at a particular moment in time (as in Nurmsoo & Robinson, 2007, March and 2007, October). Under this explanation, although children understood why the inaccurate speakers erred, the speakers' history of accuracy or inaccuracy

was weighed more heavily when children were offered generalizable, semantic knowledge. In contrast, when offered epistemic knowledge, such as the (temporary) content of a box, the risks of learning something false might be less serious and children might take the less cautious approach of excusing inaccuracy that occurred due to temporary circumstances that no longer hold.

Further research could test this possibility by using the same procedures for the two different types of knowledge transfer. If the suggestion is correct, then when children are informed about the temporary content of a container, they will excuse speakers' explainable prior inaccuracy with both the typical video procedure and the interactive face-to-face procedure used by Nurmsoo and Robinson (2007, March, 2007, October). In contrast, when children are informed about the name or function of a novel object, they will avoid learning from an inaccurate speaker whatever the reason for the inaccuracy when using the video procedure. On the other hand, if the absence of normal communicative cues in the typical video procedure is responsible for children's failure to consider *why* the speaker erred (the second possibility outlined above), then with that procedure they will focus only on speakers' accuracy or inaccuracy whether the knowledge conveyed is generalizable or not.

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