OXFORD
BROOKES
UNIVERSITY

Do children excuse past inaccuracy when learning episodic information as opposed to semantic information?

Rosie Mount

Supervised by Shiri Einav   March 2012

Do children excuse past inaccuracy when learning episodic information as opposed to semantic information?

ABSTRACT

Research has shown that children are not passive recipients of information, and do not readily accept information from any given source, but rather guide their trust investments with knowledge about an informant's perceived reliability. This study investigated whether children would excuse the errors of informants when they were due to temporary circumstances and whether, in children doing so, there was a difference between semantic and episodic learning conditions. This follows on from a hypothesized risk-associated phenomenon, whereby children may be more reluctant to risk learning inaccurate information about generalizable world knowledge but, contrastingly, are more willing to take this risk when learning situational, short-term knowledge. The present study investigated this by examining the evidence for mentalistic reasoning in a semantic condition compared to an episodic condition. Children (N = 118) between age 4-5 and 6-7 observed a video whereby two speakers (one blindfolded, and one well-informed) gave consistently conflicting and incorrect labels for objects, or locations of a hidden teddy-bear. Children across both age groups showed no preference for the previously blindfolded inaccurate informant over the well-informed inaccurate informant in both the episodic and semantic condition. Explanations for this are discussed.

KEY WORDS:	MENTALISTIC REASONING	EPISODIC INFORMATION	SEMANTIC INFORMATION	TESTIMONY	RELIABILITY

Introduction

Knowledge of the world is learnt rapidly and continually throughout childhood, and much of this knowledge is passed on to children by others, namely adults. However, children must learn that, for a number of reasons, adults may sometimes be wrong. People can be misinformed, ignorant, biased, or deliberately lying when giving information and these are major set-backs to learning. Since childhood is a very important time for developing knowledge and skills, children must accumulate strategies for inferring someone's likelihood of getting things right or wrong, and employ these strategies when people are offering information to them.

A body of research has suggested that children are not simply passive recipients of information. Instead, they inform their future decisions about whom to trust based on their observations of how accurate a person has proved to be in the past (Birch, Vauthier & Bloom, 2008; Koenig, Clement & Harris, 2004; Koenig &Harris, 2005; Harris, 2007; Jaswal & Neely, 2006; Pasquini, Corriveau, Koenig & Harris, 2007, Clement, Koenig & Harris, 2004). Harris (2007) suggests that, since an informant's testimony may not consistently correspond with one's own observations of the world, a more inductively secure approach is to monitor the accuracy or inaccuracy of an informant's testimony, as it is reasonable to believe that a person who has been accurate in the past is also likely to be accurate in the future. Studies which have shown children to be more trusting of adults who have been accurate in the past typically use similar procedures: history trials to build up speakers' track records of accuracy and inaccuracy and subsequent test trials, which require children to endorse one speaker over the other. History trials normally entail, for example, two speakers naming an object that is familiar to children, where one speaker gives consistently correct answers and the other gives consistently incorrect answers. For the test trials, speakers then use non-words to name objects that are unfamiliar to children, who are asked a forced choice question regarding which answer is right. For example, "Can you tell me what this is called, a mido or a toma?" (Koenig *et al.*, 2004). Since the children do not know which answer is right, they have no choice but to base their decision on the perceived reliability of each speaker in getting the correct answer.

The processes behind children's decision making when it comes to endorsing a previously reliable individual are debatable, since it is unclear whether children make mentalistic interpretations about the input of speakers in relation to their outputs when choosing whom to endorse, or simply base endorsements according to the output alone. I.e. do children understand that informants have underlying knowledge about the world (input), and that such knowledge is variable between persons and situations, and subsequently base their endorsements of others using this understanding? Or are they simply judging who is most reliable on a purely behavioural level (output), i.e. that (blindfolded) person never gets it right, so I will not believe them in future. Harris (2007) asserts that children display 'selective trust' when they assess the reliability of speakers, which involves making mental attributions about informants. He states that, for example, four year old children will endorse an informant who is accurate 75% of the time over one who is accurate 25% of the time (Harris, 2007). This indicates that even when in/accuracy is inconsistent, four year olds realise that, despite occasional erring, one informant may still be more

reliable than another, suggesting that there are more sophisticated processes underway when children are assessing relative reliability (Harris, 2007).

Moore, Bryant and Furrow (1989) demonstrated that when an informant varies their mental verbs to express the confidence of their knowledge, children are more likely to display trust in the most confident informant. They found that the informant who said 'I *know'* evoked more trust from children compared to when an informant said 'I *think'* or '*guess'* as an indication of their certainty of an object's location (Moore *et al.*, 1989). This suggests that by the age of four, children have an understanding of the implications of such mental terms and may be using such inferences to guide them when investing their trust in informants. Such evidence is supportive of Harris' (2007) assertion that children make mentalistic interpretations about informants; i.e. they take into consideration that people vary in their knowledge about things and pick up cues that might be revealing of depth of knowledge. In fact, Koenig and Echols (2003) found that children as young as 16 months looked longer at a speaker when she labeled an object incorrectly compared to when she labeled it correctly- an effect that was not observed when the forward-facing human was replaced with an audio-speaker, a hidden speaker, or a backwards-facing human speaker; infants also looked significantly longer at the backward-facing human speaker when they labeled an object correctly. Koenig and Echols (2003) suggest that these findings not only exemplify infants' awareness of humans as communicators of truth, but also an awareness that people vary in terms of knowledge and that knowledge can sometimes depend on access to perceptual stimuli; i.e. even infants are not 'output-minded' (Birch *et al.*, 2008, p. 1032).

However, Birch *et al.* (2008) note that the alternative to children making inferences about mental states is that they are simply making decisions about reliability using inductive reasoning. It could be that childrens' reliance upon informants is analogous to reliance on two non-mentalistic entities such as clocks: if clock A gives the correct time more than clock B, then clock A is likely to be relied upon in the future, based purely on its output rather than its internal features (Birch *et al.*, 2008).

Indeed, Nurmsoo and Robinson (2009a) state that there is no compelling evidence for children making mentalistic interpretations. In their study, they used an inaccurate speaker who was blindfolded to see whether children would excuse the blindfolded informant at test once their blindfold was removed, on the grounds that their errors were excusable. Had children excused the previously blindfolded speaker and endorsed her subsequent testimonies (in comparison to a second speaker who erred for no reason), Nurmsoo and Robinson (2009a) considered that this would be good evidence for children making mentalistic interpretations. They found, however, that children did not endorse the previously blindfolded speaker any more or less than they did the inaccurate speaker who had no reason to err; instead they endorsed speakers based only on their outputs. This was still the case when an introductory clip was added to the series of videos showing both speakers giving correct answers so as to present the blindfolded speaker as accurate when they were not blindfolded. This was despite the fact that 83% of children who gave spontaneous responses acknowledged that the blindfold was both the reason that the speaker could not see, and the reason that they erred (Nurmsoo & Robinson, 2009a).

In 2009, Nurmsoo and Robinson's further research focused on an episodic learning task with children between the ages of 3 and 6. This involved either an 'informed' or 'uninformed' puppet in a task that involved seeing and feeling toys in tunnels in order to identify and confirm their colours and their physical properties. Children saw the uninformed puppet make errors whilst ill-informed as well as the informed puppet make errors whilst fully-informed. The test trials were such that children had to either rely on the well-informed testimony of the puppet (whose answer was always contradictory to the child), or pursue their original uninformed guess, in order to see whether children would believe the puppet's answers when it was better informed than they were (Nurmsoo & Robinson, 2009b). They found that children who saw the informed but inaccurate puppet performed no differently from chance in the test trials, compared to the children who saw the ill-informed inaccurate puppet, who were significantly more likely to trust the puppet when its errors were due to being ill-informed (i.e. inadequate access to the stimulus) than when there was no reason for error; and there was no difference between age groups (Nurmsoo & Robinson, 2009b).

The results suggest that children not only take into account the history of an informant's past in/accuracy, but also the reasons for that in/accuracy; when a speaker was incorrect because of a circumstantial lack of perceptual information, children quite rightly did not predict that the speaker would be inaccurate again when the circumstances changed (Nurmsoo & Robinson, 2009b). The authors argue that this exemplifies that children *do* undergo mentalistic reasoning, and do not treat informants as they might do an accurate and inaccurate clock, as suggested by Birch *et al.* (2008). Nurmsoo and Robinson (2009b) assert that their research demonstrates 3-4 year olds' capacity to find the balance between risking believing someone who is unreliable, and missing out on learning from someone whose short-term, situational circumstances caused their inaccuracy in the past. They conclude by suggesting that further experimentation should examine the limits of such 'well-balanced behaviour' (Nurmsoo & Robinson, 2009b). This is contradictory to the results of Nurmsoo and Robinson (2009a), however, which should have obtained similar results if children are able to undergo mentalistic reasoning.

Nurmsoo and Robinson (2009a) discussed three potential reasons for their findings: the first was that children aged 3 to 7 do not make mentalistic interpretations of speakers' testimonies and that, understanding that being temporarily ill-informed affects accuracy may be a different process to actually predicting someone's accuracy in the future, and children may not amalgamate these two entities. However, they noted that although this may have been applicable to the younger participants, this was not such a plausible explanation for the 6-7 year olds who did not excuse the previously blindfolded informant even though they should be accustomed to mental state reasoning (Nurmsoo & Robinson, 2009a).

Their second explanation was that children do make mental interpretations, but the procedure they used lacked the social cues that are typical of every-day life. For example, an incorrect response from a fully-informed adult might normally be met by some sort of surprised reaction, or an attempt at correction by the other adult present: something that was not a part of the experimental procedure. Thus, Nurmsoo and Robinson (2009a) suggest that children may be focusing on output as

they would do for a machine because the speakers perform mechanically in the procedure.

They deem their third explanation the most conceivable: that the content of information that is presented to children in their studies (as well as other published work) is determinate of children's responses. They speculate as to whether children exercise more caution when they are given information of a generalizable, semantic nature and perhaps less so when learning episodic knowledge such as where an object is hidden at a given moment in time (Nurmsoo & Robinson, 2009a). This would offer an explanation as to why children do not excuse informants when they are offered semantic information, despite their awareness of the nature of blindfolds as barriers to perceptual knowledge. It is possible that the risk of learning inaccurate information is less severe in the context of episodic information given that the information is only temporarily relevant, as opposed to enduring world-knowledge (Nurmsoo & Robinson, 2009a). If this explanation were true, it would explain the discrepancy between the results of Nurmsoo and Robinson (2009a) and Nurmsoo and Robinson (2009b).

In order to examine whether such balanced behaviour is limited to episodic learning, the present study will investigate the difference between semantic and episodic learning contexts using the same design as experiment 2 in Nurmsoo and Robinson (2009a). A blindfolded and inaccurate informant will be presented alongside a fully-informed but inaccurate informant in an episodic learning task, and in a second semantic learning task. The present study was the first to test both semantic and episodic learning conditions using the same paradigm; this is significant since the conflicting results of Nurmsoo and Robinson (2009a) and Nurmsoo and Robinson (2009b) could be due to their use of different paradigms. Nurmsoo and Robinson (2009a) may have lacked realism in their use of videos, for example, compared to Nurmsoo and Robinson (2009b) whose procedure was carried out live with the children. In using the same paradigm for both conditions in the present study, methodological differences can be ruled out as an explanation for any differences between the two conditions.

If trust is influenced by informational content, there should be a difference between the semantic and episodic condition, whereby children will be more likely to excuse and show preference towards the previously inaccurate blindfolded informant in the episodic condition, as in Nurmsoo and Robinson (2009b), compared to the semantic condition, where it is expected that children will endorse informants indiscriminately, as in Nurmsoo and Robinson (2009a). Children will also be split into two age groups of 4-5 and 6-7 year olds to explore any developmental differences. Much research has used 3-4 year olds (Birch *et al.*, 2008; Pasquini *et al.*, 2007; Jaswal & Neely, 2006; Koenig & Harris, 2005, Nurmsoo & Robinson, 2009a) therefore the present study will investigate whether making mentalistic interpretations is also age-dependent.

Method

Participants

Participants were 118 children. Sixty four children (34 boys) were between age 4 and 5 and were in reception or year 1 (M = 4;07, range 4;04 to 5;11) and 54 children (30 boys) were between age 6 and 7, and in year 1 or year 2 (M = 6;04, range 6;0 to 7;04). All of the children attended primary schools in areas of mostly white, working- and middle-class populations in Shepway and Ashford, Kent.

Materials

Twenty four video clips were produced, with 4 history trials and 4 test trials for both the semantic condition and the episodic condition. For counterbalancing purposes, each condition's test trials had 4 alternative video clips created which reversed the order in which actors spoke and the labels they provided. There were two, young female actors who were similar in age but distinct in their appearances (hair and clothes) and a third male actor of a similar age who sat between the two females and placed the objects/teddy and asked the questions. For the episodic condition, each history trial video showed the male actor place a teddy (see appendix 1a) in one of 8 coloured boxes which were lined up on the table at which they were seated. A scarf was used as a blindfold which, alongside the teddy was presented to the children. In the semantic condition, the history trials showed the male actor place a familiar object on the table between the two speakers: a book (labeled as a plate and a mirror); a cup (labeled as a phone and a drum); a ball (labeled as a teddy and a cushion); and a lamp (labeled as a shoe and a doll). The third actor presented unfamiliar objects in the test trials: a honey stick (labeled as a blicket and a fendle) (see appendix 1b); a scraper for baking (labeled as a grimmel and a ferber) (see appendix 1c); a mini lemon juicer (labeled as a fep and a rif) (see appendix 1d); and a small piece of bent metal (labeled as a danu and a modi) (see appendix 1e). All non-words were sourced from previous research. As well as the scarf, all of the objects used were presented to the children alongside the video.

Design and procedure

Children were tested individually outside the classroom in a quiet corner, and testing sessions lasted between 7-10 minutes. Children were randomly assigned to the semantic or episodic condition, and saw 4 history trials and 4 test trials. Before the videos were presented, the experimenter introduced the task and children were shown that a scarf could be used as a blindfold. It was pointed out that one of the speakers was going to wear a blindfold, and that this meant they would not be able to see.

In the episodic condition, for each of the 4 *history* trials (see appendix 2a for an example), the third male actor placed the teddy in one of the coloured boxes, and two speakers (one blindfolded, one fully sighted) gave contrasting, incorrect answers when asked, "Which box do you think the teddy went in?" For example, one speaker would say, "I think it went in the red box" and the other would say, "I think it went in the white box". Children were told to repeat the answers that the speakers gave and were asked, "Which box did the teddy *really* go in?" If the children did not repeat the

answers correctly or did not state the correct location of the teddy, the videos were replayed up to 2 times. The purpose of these history trials was to establish a pattern of both speakers being unreliable informants, where one speaker was consistently but excusably incorrect (the blindfolded speaker) and the other was consistently but inexcusably incorrect because she was fully sighted and had no obvious reason to err.

In the 4 episodic *test* trials, the procedure was identical to the history trials except that the previously blindfolded speaker had her blindfold removed, and this was explicitly pointed out by the experimenter, who stated, "Look, she's having her blindfold taken off now!" Additionally, the boxes were not shown, which meant children could not see where the teddy was hidden (see appendix 2b for an example): this was to ensure that children had no choice but to endorse speakers based on their perceived reliability rather than their actual performance. Children were asked to repeat the speakers' answers and the experimenter pointed at each speaker and asked, for example, "She said it went in the pink box, and she said it went in the yellow box. So which box did it go in? The pink box or the yellow box?"

For the semantic condition, the third male actor placed an object on the table between the two speakers and asked each speaker in turn, "What do you think this is?" to which both speakers gave contrasting and incorrect answers. The history trials used 4 familiar objects (see appendix 2c for an example), and the test trials used 4 unfamiliar objects (see appendix 2d for an example). As in the episodic condition, children were asked to repeat the speakers' answers, and in the history trials they were asked, "What is it really?" The history trials served the same purpose as in the episodic condition by establishing consistent inaccuracy by both the blindfolded and fully sighted speakers. As in the episodic condition, the test trials showed the previously blindfolded speaker have her blindfold removed and the child's attention was explicitly drawn to this by the experimenter.

The same procedure was followed for the test trials, except that the objects presented were unfamiliar ones, and the labels given by the speakers were novel words. It was presumed that the children would not know what the unfamiliar objects were, and therefore they would have no choice but to base endorsements of the speakers' answers on their perceived reliability rather than their actual performance. Children were asked to repeat the speakers' answers and the experimenter pointed to each speaker and asked, for example, "She said it's a blicket, and she said it's a fendle. So what is it? Is it a blicket or a fendle?"

For both conditions, the order of the labels used in the forced choice test questions were corresponding to the order in which they were spoken on the videos, and the order in which the speakers spoke as well as the answers they gave were counterbalanced. Post-test, the experimenter pointed to the speakers, and children were always asked, "In the first part of the video both of these girls kept getting the answers wrong, didn't they?! Why do you think she was getting it wrong? (to both speakers)". Children who said that the speakers did get the answers right, or gave unreasonable answers such as, "Because she could see", were excluded from the data analysis. This decision was only made where there was an obvious lack of comprehension. Children who gave no answer or said, 'I don't know' were not excluded from the data analysis.

Results

For each of the 4 test trials, children were given a point if they endorsed the previously blindfolded speaker. Results are summarized in Table 1. Preliminary analysis showed that there were no gender effects or sequence effects on performance, therefore the data was collapsed across these variables. A 2 X 2 between-subjects ANOVA was carried out with age group and condition as independent variables, and there was no main effect for age $F(1,1) = .117$ $p = .73$; condition $F(1,1) = .357$ $p = .55$, and there was no significant interaction $F(1,1) = 3.07$ $p = .08$. If episodic information was less important to children, it would be expected that children would be more likely to endorse the previously blindfolded speaker on test trials. However, planned one-sample t-test comparisons to a chance score of 2 showed that children performed no differently from chance in both the episodic condition, 4-5 year olds: $t(32) = -1.23$, $p = .23$; 6-7 year olds: $t(26) = 1.28$, $p = .21$ and the semantic condition, 4-5 year olds: $t(30) = .00$, $p = 1.0$; 6-7 year olds: $t(26) = -1.14$, $p = .27$.

Post-test results show that 76% of all children across age and condition accounted for the blindfold as the reason for prior inaccuracy of the previously blindfolded informant, such as "she had the blindfold on", despite the fact that they did not endorse the previously blindfolded speaker's answers any more or less than they did the speaker who had no obvious reason to err. Only 23% of children made reasonable comments as to why the fully sighted and inaccurate speaker was erring, whilst the majority gave practical reasons as to why she erred such as, "She wasn't looking properly".

Table 1
The mean number of times the previously blindfolded speaker's label was endorsed on test trials

Age group	Condition (*n*)	Number of times previously blindfolded speaker's label endorsed					*M (SD)*
		0	1	2	3	4	
4-5 year olds	Episodic (33)	1	10	18	2	2	1.82 (0.85)
	Semantic (31)	1	7	16	5	2	2.0 (0.89)
6-7 year olds	Episodic (27)	0	3	17	7	0	2.15 (0.6)
	Semantic (27)	2	9	11	3	2	1.78 (1.01)

Discussion

The aim of the present study was to investigate whether children would excuse the inaccuracy of a previously blindfolded informant and endorse their responses over a previously inaccurate speaker who had no reason to err in an episodic learning condition compared to a semantic learning condition. The present study also aimed to investigate whether an older group of children had a developmental advantage over younger children in their performance, since the majority of research in this area has focused solely on 3-4 year olds (Birch *et al.*, 2008; Pasquini *et al.*, 2007; Jaswal & Neely, 2006; Koenig & Harris, 2005, Koenig, Clement & Harris, 2004, Nurmsoo & Robinson, 2009a). The rationale for the study followed from previous findings that children do not excuse past inaccuracy regardless of its justifiability in a semantic context (Nurmsoo & Robinson, 2009a) and the findings that children do excuse past inaccuracy when it is justifiable in an episodic context (Nurmsoo & Robinson, 2009b).

The procedure was heavily based on that used by Nurmsoo and Robinson (2009a), extending their research by adding a second, episodic condition to compare against a semantic condition. It was anticipated that the results would be an amalgamation of Nurmsoo and Robinson (2009a) and (2009b) in that children would be more likely to endorse the previously blindfolded inaccurate informant over the informant who was inaccurate for no reason: more so in the episodic condition than the semantic condition. This was based on the premise that generalizable world knowledge (i.e. naming objects) holds more value and therefore has more risk attached to learning potentially incorrect information compared to temporary and situational information (i.e. knowing the location of a teddy), which is likely to be less important respectively.

In fact, children did not discriminate significantly between the previously blindfolded inaccurate informant and the inexcusably inaccurate informant in their endorsements and selected between the two no differently from that which would be expected by chance. This was the case for both the semantic and episodic condition and in both age groups, meaning that none of the children were showing more trust in the informant who had an excuse for their prior inaccuracy either when the information was of a semantic or an episodic nature. The results therefore replicate Nurmsoo and Robinson (2009a). Analysis of the post-test question, however, revealed that 76% of children attributed the blindfold as the reason the previously blindfolded speaker erred. This is support for children making mental interpretations about speakers' answers. However, the test results are counterintuitive to this. In order to make sense of these results, it is vital to look at a variety of potential explanations.

Kalish (2002) suggests that young childrens' ideas about psychological cause do not enable them to make predictions about consistency, and that children tend to overestimate the extent to which events are voluntary compared to adults (Kalish, 2002). Indeed, only 23% of children in the present study gave *reasonable* answers for the post-test question as to why the fully sighted speaker was answering incorrectly: i.e. that she didn't know the answers, or she'd never seen the objects before. The majority of children gave practical reasons as to why the fully-informed speaker was erring, such as that she wasn't looking properly, or because she didn't want the other girl to know the answers, thus inferring intentionality in the speaker's erring. It might be concluded that children perceived speakers as purposefully getting

the answers wrong, rather than attributing their inaccuracy to factors outside of their control (i.e. wearing a blindfold, or not knowing the answer). However, this is not such a full explanation in light of the post-test results which also show that the vast majority of children understood that the blindfold was the cause of inaccuracy. If the children were overestimating the extent to which speakers acted voluntarily, they would presumably underestimate that the speaker could be excused of being wrong because she was wearing a blindfold.

Kalish (2002) also suggests that children may be hesitant to predict consistency for unfamiliar events involving human actors, hence the inconsistency in their choices. This seems a plausible explanation in relation to the results of the present study, where, without using inferences about the speakers to guide their decision, a complementary technique in their endorsements seems the most effective strategy in the face of uncertainty. In fact, Nurmsoo and Robinson (2009a), in reference to future research akin to the present study, predicted that should future results fail to find a difference between episodic and semantic conditions, it is likely to be because of an absence of 'normal communicative cues' in the video procedure. Indeed, many of the children were hesitant in giving answers on test trials, which may have been a reflection on the strangeness of the task in relation to real-life.

Another methodological point to consider is that children are likely to be familiar with concepts of fairness and are potentially used to being presented with formulaic depictions of turn taking within the educational setting. This is noteworthy since many of the children seemed to be preoccupied with the notion of fairness and equality during the experiment and made spontaneous comments that the fully sighted speaker *couldn't* look in some way because this would be 'unfair' on the blindfolded girl; indeed some children said that the fully sighted speaker was 'cheating' because she was looking. It is possible that this is related to the suggestion in Kalish (2002) that children overestimate the extent to which actions are voluntary. However, the comments made by the children were very central to fairness and turn taking, for example: 'Is *she* going to wear the blindfold now?'

It is reasonable to suggest that methodological issues play a part in the results of the study in terms of the naturalistic quality of the procedure, particularly given the unfamiliarity of adults making errors about very simple concepts. On the other hand, Nurmsoo and Robinson (2009b) found that children were able to forgive an ill-informed inaccurate puppet, which somewhat contradicts the latter point raised. However, it may be that children can engage more with the concept of inaccurate puppets compared to inaccurate adults, since children will have experienced many situations in which adults know more than they do (Jaswal & Neely, 2006) and may feel quite alarmed and baffled by the absurdity of the entire concept of them being wrong. This in itself may have overwhelmed any consideration about a speaker being ill-informed in the present study.

The children's responses in the present study, i.e. their statistical resemblance to chance performance, may not be a response to uncertainty or bafflement, however. In Kalish (2002), 4-5 year olds did not predict that because a person displayed a certain trait, they would display the same trait in the future; instead children subscribed to a complementary principle of behaviour when predicting the intentional choices of people. For example if a person chose one coloured object before, they

would choose a different colour the next time (Kalish, 2002). This was an observed effect in the present study. Many of the children thought that the two speakers would be correct alternately in what seemed like a principle of balance; hence the finding that performance was no difference to chance. It is difficult to know however, whether these complementary endorsements reflected children's belief that one speaker would get the right answer, and then the next speaker would get it right; or whether endorsing alternate speakers satiated the child's own needs for choosing one and then the other. Either way, the results infer that children were not applying any mentalistic reasoning to their endorsements of the speakers. This links to Nurmsoo and Robinson's (2009a) suggestion that children may be able to make mentalistic interpretations about informants, but are unable to implement them in predicting their future accuracy. This was not the case in Nurmsoo and Robinson (2009b) though, whereby it was demonstrated that children *were* able to factor in that a previously ill-informed puppet was more reliable once fully-informed.

In the absence of conceptual explanations for the results, it is perhaps more helpful to look at the methodological discrepancies between the present study and Nurmsoo and Robinson (2009b), in particular. Nurmsoo and Robinson (2009b) were dissimilar in that puppets were used in the procedure, rather than video clips, and children had a far more 'hands-on' role in the experiment. Children had to observe and feel toys in order to answer questions about them, and took turns with the puppets in giving answers. They were then required, at test, to rely on either their own guess, or that of the puppet (Nurmsoo & Robinson, 2009b). Although in the current study children were asked, for example, 'which box did the teddy go in *really*?' this was the extent to which the children were actively involved; children in Nurmsoo and Robinson (2009b) had comparatively far greater involvement in the task. It may be that since the children in Nurmsoo and Robinson (2009b) were goal-oriented in getting the answer right, and were asked to make a decision, they may have been drawing upon mentalistic reasoning about whom to rely upon in guiding their performance. The children in the present study may therefore not have been engaged adequately since they were simply observing the task of the speakers on the video: it was the speakers' task, not theirs.

Closely related to this are the findings of Robinson and Whitcombe (2003), who investigated how childrens' understanding about the source of knowledge related to their suggestibility. In the task, children were tested on whether they would stand by their own belief about an object's identity, or endorse the experimenter's contradicting answer, whose access to information varied (Robinson & Whitcombe, 2003). Although the research was focused on source-monitoring, there was a specific finding in the results that bears relation to those reported for the present study. The task that Robinson and Whitcombe (2003) used was comprised of 10 trials: in 6 of these, the child was actively participating in a tunnel game, and in 4 trials they were an observer of a video game in which a similar game was shown. Crucially, the authors reported that when the 3-4 year olds observed the game on the video rather than participated in the game, they were inaccurate in basing their decisions on how well-informed the speakers were in terms of which of the two contradicting answers to believe: they did not make the comparisons between the speakers that they needed to (Robinson & Whitcombe, 2003). This is in contrast to the results of 3-4 year olds when they were actively *participating* in the tunnel game, where children *did* show sensitivity to the informed-ness of speakers who

contradicted their beliefs. In this context, children were able to reject the speaker's answer that was contradictory to their own whenever that speaker was ill-informed (Robinson & Whitcombe, 2003).

Robinson and Whitcombe (2003) suggest that this discrepancy in ability between the two contexts might be because the child in the game could accurately decide which speaker was better informed by drawing on implicit and automatic processes; but that the same task in the observing trials required more of the children in terms of abstract or reflective understanding of the knowledge one acquires from seeing and feeling an object (as was vitally part of the game). It may be that a similar discrepancy in ability is present between participants in the present study (observing a video), and participants in Nurmsoo and Robinson (2009b) (participating in a game). Although the two studies are measuring the same variables, it may be the methodological difference between observation and participation that causes the difference in results. Had the procedure of the present study resembled that of Nurmsoo and Robinson (2009b) and Robinson and Whitcombe (2003), children may have used the mentalistic reasoning about speakers that they demonstrated in the post-test question to guide their endorsements.

The fact that 76% of children cited the blindfold as the reason for the speaker's inaccuracy in the present study holds as robust evidence that children were not simply focusing on speakers' outputs as incorrect, but acknowledged that they were incorrect because the speaker did not have perceptual access to the stimuli in front of her. This, despite the fact that mentalistic interpretations did not guide their endorsements of speakers, demonstrates that children have the capacity to understand that knowledge can be hindered by temporary factors. It is not entirely clear why children did not use mentalistic interpretations to conclude that the previously blindfolded speaker was likely to be more reliable once her blindfold had been removed, but the explanations discussed may shed some light on the findings, and open up new opportunities for future research to investigate.

Considering the results of the present study in the context of previous research (Nurmsoo & Robinson, 2009a; 2009b; Robinson & Whitcombe, 2003) it would follow from this to replicate the experiment but design the procedure so as to actively involve children in the semantic and episodic tasks. This may give more insight into any differences between semantic and episodic learning, because children have been shown to apply mentalistic reasoning about informants in making appropriate decisions concerning reliability when they are active participants in tasks that require these skills (Nurmsoo & Robinson, 2009; Robinson & Whitcombe, 2004). Clarifying the processes underlying the differentiation between active participation in tasks and observing tasks is another area for future research.

To conclude, the results do not reveal a difference between episodic and semantic learning contexts in terms of excusing a previously blindfolded and inaccurate informant compared to an unforgivably inaccurate informant, and this was the same for both 4-5 year olds and 6-7 year olds. In fact, children showed no preference for the previously blindfolded and inaccurate informant compared to a fully informed and inaccurate informant across conditions. Since, generally, children understood that the previously blindfolded informant erred due to her blindfold, it cannot be ruled out that children are making mentalistic interpretations. Further investigation therefore

needs to clarify the conditions under which children *apply* their mentalistic reasoning to guide their actions when they make appropriate decisions about who is more reliable. Once this has been established, it will open up opportunities to explore whether children are more willing to forgive justifiable inaccuracy in an episodic learning condition compared to a semantic one.

References

Birch, S. A. J., Vauthier, S. A., & Bloom, P. (2008). Three- and four-year-olds spontaneously
use others' past performance to guide their learning. *Cognition,* 107, 1018-1034.

D'Entremont, B., & Morgan, R. (2006). Experience with visual barriers and its effect on subsequent gaze-following in 12- to 13-month-olds. *British Journal of Developmental Psychology,* 24, 465-475.

Harris, P. L. (2007). Trust. *Developmental Science,*10, 135-138.

Jaswal, V. K., & Neely, L. A. (2006). Adults Don't Always Know Best : Preschoolers Use Past Reliability Over Age When Learning New Words. *Psychological Science*, 74, 757-758.

Kalish, C. W. (2002). Children's predictions of consistency in people's actions. *Cognition,* 84, 237-265.

Koenig, M. A., & Echols, C. H. (2003). Infants' understanding of false labeling events:
the referential roles of words and the speakers who use them. *Cognition,* 87, 179-208.

Koenig, M. A., & Harris, P. L. (2005). Preschoolers Mistrust Ignorant and Inaccurate Speakers. *Child Development,* 76, 1261-1277.

Koenig, M. A., Clément, F., & Harris, P. L. (2004). Trust in Testimony: Children's Use of True and False Statements. *Psychological Science,* 15, 694-698.

Nurmsoo, E., & Robinson, E. J. (2009a). Identifying unreliable informants: do children excuse past inaccuracy? *Developmental Science,* 12, 41-47.

Nurmsoo, E., & Robinson, E. J. (2009b). Children's Trust in Previously Inaccurate Informants Who Were Well or Poorly Informed: When Past Errors Can Be Excused. *Child Development,* 80, 23-27.

Pasquini, E. S., Corriveau, K. H., Koenig, M., & Harris, P. L. (2007). Preschoolers Monitor the Relative Accuracy of Informants. *Developmental Psychology,* 43, 1216-1226.

Robinson, E. J., & Whitcombe, E. L. (2003). Children's Suggestibility in Relation to their Understanding about Sources of Knowledge. *Child Development,* 74, 48-62.

Wimmer, H., Jürgen Hogrefe, G., & Perner, J.(1988). Children's Understanding of Informational Access as Source of Knowledge. *Child Development,* 59, 386-396.