Children’s Use of Information Quality to Establish Speaker Preferences

Randall L. Gillis and Elizabeth S. Nilsen
University of Waterloo

Knowledge transfer is most effective when speakers provide good quality (in addition to accurate) information. Two studies investigated whether preschool- (4–5 years old) and school-age (6–7 years old) children prefer speakers who provide sufficient information over those who provide insufficient (yet accurate) information. Children were provided clues to the location of hidden dots by speakers who varied in quality and accuracy. Subsequently, children decided from whom they would like to receive additional information. In Study 1, when the outcome of the clue was clear, preschool- (n = 40) and school-age (n = 42) children chose to solicit information from sufficient rather than from insufficient speakers. In Study 2, when not provided with information about the outcome of the speakers’ clues, school-age (n = 22), but not preschool-age (n = 19), children preferred sufficient relative to insufficient speakers. Results highlight a developmental progression in children’s use of information quality as a cue to determining that individuals are preferable informants.

Keywords: speaker reliability, speaker quality, speaker knowledge, communicative ambiguity, Gricean maxims

Attending to the characteristics of potential informational sources enables listeners to acquire information more efficiently and effectively. For example, even though children encode information from both reliable and unreliable sources, they only form semantic representations on the basis of information from reliable sources (Sabbagh & Shafman, 2009). A typical paradigm used to investigate the characteristics children attend to when determining speaker credibility involves presenting children with conflicting testimony from two individuals (e.g., different labels for novel objects). Then, children’s adoption or application of the information is assessed to determine on which informant the children relied (e.g., which label was mapped to the novel object; e.g., Birch, Vauthier, & Bloom, 2008; Koenig et al., 2004; Pasquini, Corriveau, Koenig, & Harris, 2007). In this way, children’s preference for particular informant characteristics can be inferred. Using this (or similar) methodology, a number of characteristics affecting children’s judgments of informant credibility have been determined. For example, children prefer to learn from speakers who are familiar (Corriveau & Harris, 2009), are adults (as opposed to other children; Jaswal & Neely, 2006), are nondissenting (Corriveau, Fusaro, & Harris, 2009), and are native speakers of the child’s own language (as opposed to those with accents; Kinzler, Corriveau, & Harris, 2011).

A consistent finding in this body of literature is that children prefer to learn from speakers who are knowledgeable versus those who are not (Birch et al., 2008; Koenig & Harris, 2005; Sabbagh & Baldwin, 2001). Specifically, speakers who demonstrate a history of being knowledgeable (e.g., accurate object labeling; e.g., Corriveau, Meints, & Harris, 2009; Koenig et al., 2004; Scofield & Behrend, 2008) as well as speakers who announce their knowledge (e.g., Koenig & Harris, 2005; Sabbagh & Baldwin, 2001) are preferred to speakers who have a history of inaccurate labeling or who announce their ignorance. Children give greater weight to speakers’ knowledge than other characteristics. For example, children override their preference for learning from adults when a
child informant has demonstrated a history of accuracy or if the information being sought is more child-relevant (Jaswal & Neely, 2006; VanderBorght & Jaswal, 2009). Further, children attend to whether speakers have had the opportunity to acquire particular knowledge and will excise inaccuracies if resulting from lack of exposure (e.g., Brosseau-Liard & Birch, 2011; Nurmsoo & Robinson, 2009).

Together, the research suggests that children are highly tuned to cues about a speaker’s knowledge state. Recent work has started to explore the sorts of cues (beyond accuracy) that children rely on in order to infer the knowledge of their informational sources. For example, children are more likely to rely on speakers who deliver information with a confident presentation style, potentially because the speakers’ knowledge can be inferred through their confidence (Birch, Akmal, & Frampton, 2010; Tenney, Small, Konrad, Jaswal, & Spellman, 2011). In the present work, we examined whether children use the quality of information presented as a means to form speaker preferences, potentially due to the attributes they make regarding a speaker’s knowledge state, after the speaker provides sufficient versus insufficient information.

Previous work examining speakers’ credibility has often required children to differentiate between inaccurate versus accurate speakers. However, in children’s daily life, it is more likely that they will be faced with vague information as opposed to information that is blatantly incorrect. Certainly, adults often generate utterances that are insufficient for their conversational partners (e.g., Ferreira & Dell, 2000; Kraljic & Brennan, 2005) without recognizing the ambiguity inherent in their utterances (e.g., Keysar & Henly, 2002). As such, it would be advantageous for children to be attuned to the quality of information, in addition to the accuracy of information. In this study, we sought to determine whether children are more likely to rely on speakers who provide descriptions that are sufficient (for the successful completion of a task) relative to speakers who provide insufficient (yet accurate) information and, further, whether insufficient speakers are differentiated from speakers who provide inaccurate information. In order for the children to appreciate that the information being provided is insufficient, they are required to first appreciate that the speaker’s description is ambiguous in a given context. Specifically, when conversing with others, effective speakers will provide enough information to avoid ambiguity (maxims of quality and manner; Grice, 1975). For example, when describing a book among a stack of books, a clear description would uniquely identify the specific book desired (e.g., “the statistics book”), whereas an ambiguous statement would not (e.g., “the book”). Detecting ambiguity represents a key communicative development. In addition, identifying speakers who provide the most unambiguous descriptions would enable children to maximize the degree to which they acquire good-quality information.

However, past research has demonstrated that children younger than age 6 have difficulty identifying ambiguous language (e.g., Cosgrove & Patterson, 1977; Ironsmith & Whitehurst, 1978; Robinson, 1981), which would suggest they may not differentially prefer to acquire information from an insufficient speaker rather than from a sufficient speaker. For example, when provided with ambiguous information, children often believe that the information is sufficient for them to respond accurately (Ackerman, 1981; Robinson & Whittaker, 1985). Young school-age children also overestimate the knowledge to be gained from ambiguous information (Asher, 1976; Chandler & Helm, 1984; Robinson & Robinson, 1982; Taylor, 1988), do not ask clarifying questions (Cosgrove & Patterson, 1977; Ironsmith & Whitehurst, 1978; Robinson, 1981), and believe that if listeners tried harder, they would be more successful at understanding ambiguous messages (Robinson & Robinson, 1978). Children younger than 6 years old have an especially difficult time identifying communicative ambiguity when they previously have been informed of the intended meaning of the statement (Beal & Belgrad, 1990; Sodian, 1988). For example, when 4-year-olds saw where a sticker was hidden, they were more likely to state that the recipient of an ambiguous clue knew where the sticker was, relative to children who were ignorant of the sticker location (Nilsen, Graham, Smith, & Chambers, 2008). In this way, children show a tendency to conflate their own knowledge of the intended meaning of an inadequate message with that of the ignorant listener (e.g., representing a “curse of knowledge” whereby knowledge states of more naive others are difficult to appreciate; Birch & Bloom, 2002, 2004). This conflation makes it difficult for children to detect the ambiguity inherent in a message. However, as children get older, they become better able to detect ambiguity even when aware of the intended meaning of the statement (Beal & Belgrad, 1990; Sodian, 1988).

Despite young school-age children’s difficulty with explicitly identifying communicative ambiguity, preschool-age children demonstrate implicit sensitivity to communicative ambiguity (Nilsen et al., 2008). For example, children take longer to make a decision and display more hesitant nonverbal behavior following ambiguous versus unambiguous instructions (Beal & Flavell, 1982; Bearion & Levey, 1977; Patterson, Cosgrove, & O’Brien, 1980; Plumert, 1996). They also evidence eye movements reflecting more consideration of alternatives after hearing ambiguous statements (Sekirina, Stormswood, & Hestvik, 2004). Whereas children’s implicit sensitivity to communicative ambiguity remains consistent across the late preschool years, their explicit evaluation of clarity increases (Nilsen & Graham, 2012). Therefore, pertinent to the present study, it is plausible that both the preschool- and school-age children would show a preference for sufficient speakers, but only the school-age children would demonstrate an explicit appreciation for the informational quality of the speakers’ clues. That is, it may be the case that children who are not explicitly able to identify ambiguous language may still avoid insufficient speakers as an informational source.

The main goal of the present study was to determine whether children use the speaker’s information quality to determine from whom to solicit information. In order to address whether children are sensitive to speaker quality, preschool-age children (4- to 5-year-olds) and school-age children (6- to 7-year-olds) engaged in a speaker preference task. During this task, children were presented with clues to the location of a dot hidden under pictures in a book by pairs of alternating, videotaped speakers. These ages were chosen as it has been found that children’s ability to appreciate communicative ambiguity emerges at the end of their fifth year (Nilsen & Graham, 2012). During the task, each speaker in the pairs consistently provided clues that varied by quality and accuracy. Specifically, speakers either provided sufficient clues that clearly identified the correct picture concealing the dot, insufficient clues that did not provide enough information to locate the dot (but were accurate in the sense that the information did not
identify an incorrect location, or inaccurate clues that clearly identified an incorrect location.

After children were presented with the clues from each speaker in the pair, they were asked to indicate whom they would like to choose to help them find a special sticker. Although children’s speaker choices constituted an overt action, they did not necessitate that children understood why they preferred one speaker over the next. As such, children were asked to rate the ability of each of the speakers to provide information. These speaker ratings allowed for an assessment of children’s explicit evaluation of speaker quality. In this way, we were able to determine whether children preferred to rely on sufficient versus insufficient speakers, as well as whether children viewed insufficient speakers as being different from inaccurate speakers in terms of how helpful the speakers were. Further, ratings allowed for assessing whether children understood why one speaker would be preferred over the other (i.e., an explicit understanding). To link this research with previous work, we also compared sufficient and inaccurate speakers.

The second goal was to assess whether prior knowledge of the intended meaning of the clue would disrupt children’s ability to appreciate information quality and alter subsequent speaker choices. To accomplish this goal, experimenters told half the children where the dot was hidden prior to being provided with the clues. As in previous research (e.g., Nilsen et al., 2008; Sodian, 1988), we anticipated that children aware of the dot location would have more difficulty differentiating insufficient from sufficient clues because they would conflate their knowledge of the intended meaning with the semantic information presented in the clue. Therefore, we anticipated that children who were provided with prior knowledge would have more difficulty in determining who would be the most helpful informant. In addition, children’s success rate in finding the hidden dots was measured to determine the extent to which the outcome of the clues affected children’s subsequent speaker choices.

Method

Participants

Forty children who were 4 and 5 years old (11 males; age \( M = 59.43 \) months, \( SD = 7.30 \)) and 42 children who were 6 and 7 years old (14 males; age \( M = 85.14 \) months, \( SD = 6.20 \)) were recruited from schools and preschools within a mid-sized North American city. An additional 12 children were tested, but their data were not included in the analyses as they did not follow task instructions. Within each age group, excluded children did not differ from included children in terms of age or verbal skills (\( p > .53 \)); however, within the older age group, the proportion of boys was greater in the excluded sample compared with the included sample (\( p = .04 \). As gender did not significantly relate to the dependent variables, it was not included in the analyses. Parents of all participants reported that their children were fluent in English.

Children were assigned to either a knowledgeable condition (\( n = 19 \) preschool children and 22 school-age children), or an unknowledgeable condition (\( n = 21 \) preschool children and 20 school-age children). The ages of children and the distribution of sex in the knowledgeable and unknowledgeable conditions did not differ from each other (\( p > .48 \)).

Materials and Procedure

Participants were tested individually by an experimenter in a quiet room within their school setting or in the research laboratory. The speaker quality task was always administered first, followed by a language task.

Speaker quality task. The speaker quality task was modeled from previous speaker reliability research wherein children observe two speakers providing information and then are asked to make a choice between the informants. Our task involved presenting children with videotaped clues to the location of dots hidden under pictures in a stimulus book positioned in front of the child (see Figure 1). The clues were presented by alternating pairs of speakers who differed in the sufficiency of information presented (i.e., forming different speaker-type comparisons). Following the clues (i.e., learning trials), children were asked to indicate who they would like to solicit information from (speaker choice) and to rate the proficiency of each speaker (speaker rating).

Before describing the procedures in detail, the materials are described. First, there were three different types of videotaped speakers, namely, speakers who consistently presented insufficient clues, clues who presented sufficient clues (accurately identified a location), and speakers who presented inaccurate clues. The clues all had the same format (i.e., “It’s under the ___ one”). Speakers all maintained a neutral tone of voice and facial expression when generating the clues. Each clue had the potential to be sufficient, insufficient, or inaccurate depending on the context in which it was uttered. That is, the quality of the clue depended on which three pictures were displayed in the stimulus book, and the accuracy depended on which picture the dot was concealed under.

Each page of the stimulus book depicted a row of three pictures that were either three different shapes of the same color (e.g., a red circle, a red triangle, and a red star) or three identical shapes of different colors (e.g., a red circle, a green circle, and a yellow circle). On each page, a dot was concealed underneath one of the three pictures. Insufficient clues were accurate, but did not provide enough information to identify one of the three pictures. For example, if all three pictures were red, an insufficient clue would be, “It’s under the red one.” Sufficient clues were accurate and provided enough information to identify one of the three pictures (i.e., the picture that concealed the dot). For example, if all three pictures were red but different shapes, a sufficient clue would be, “It’s under the square one.” Inaccurate clues unambiguously identified one of the three pictures that did not have a dot beneath it. For example, if the dot was concealed under the triangle picture that was next to a square and circle, an incorrect clue would be, “It’s under the square one.”

By pairing the different speaker types (insufficient, sufficient, and inaccurate), there were three different comparison types: sufficient/insufficient, insufficient/inaccurate, and sufficient/inaccurate. Each comparison type involved a series of learning trials where children searched for the dots beneath the pictures following clues from alternating speakers. Children were exposed to each of the three speaker-type comparisons three separate times throughout the study, for a total of nine comparisons. These nine comparisons occurred in three blocks. Each block consisted of one of each of the three different comparison types (i.e., the sufficient/insufficient comparison, the insufficient/inaccurate comparison and the sufficient/inaccurate comparison). The specific order of
comparison types within blocks was counterbalanced across children. Each of the nine comparisons (of alternating speakers) involved different individuals (for a total of 18 speakers). All of the 18 videotaped speakers were White women between the ages of 22 and 35 with brown hair pulled back from their face. Each speaker wore a uniquely colored t-shirt. All other accessories were removed. Whether a particular speaker gave an insufficient, sufficient, or incorrect clue was counterbalanced across children. This counterbalancing was essential to ensure children’s choices were based on sufficiency or accuracy rather than some idiosyncratic quality of a particular speaker.

Children were preassigned to a knowledgeable condition or an unknowledgeable condition. In the knowledgeable condition, children were provided with information about the sticker location prior to receiving clues from the speakers (i.e., they were shown by the experimenter the picture under which the dot was hidden), whereas in the unknowledgeable condition they were not. Otherwise, the procedure was similar in both conditions: Children first received three practice trials wherein they viewed a video of a speaker giving a clue and subsequently searched for the dot under the shapes. Following the practice trials, the children were presented with the nine different speaker comparisons, where they received clues from the videotaped speakers. Children were only allowed to look under one shape following each clue. In order to motivate children to find the dots, the experimenter gave them a stamp in a booklet every time they found a dot. Following two clues from each speaker in the pair (i.e., the four learning trials for each comparison) children were asked to choose whom they would like to receive a clue from to help them find a special sticker hidden under one of the shapes on the next page (i.e., speaker choice; e.g., “You can choose either the girl in the blue shirt or the girl in the green shirt to help you find the sticker. Who do you want to help you?”). The order of presentation of the two speakers in the experimenter’s question was counterbalanced across children. Pictures of the two speakers were used to assist children in making their decision. Following their choice, children were asked to rate

![Figure 1. Example of speaker comparison procedures (sufficient/insufficient comparison).](image-url)
how good each speaker was at helping them find the dots (i.e., speaker rating; e.g., “How good was the girl in the red shirt at helping you find the dots? Was she always good, sometimes good, or never good?”). The verbal instructions of the rating were accompanied with a visual scale depicting the three options in differently sized bars. “Always good” was the tallest bar, “never good” was the shortest bar (i.e., just a thin line), and “sometimes good” was half way between “never” and “always.” Next, children were played the video of their chosen speaker providing her clue, and children searched for the sticker by choosing a shape to lift.

Variables of interest were the children’s choice of speakers and ratings of speaker proficiency following the learning trials, as well as success in finding the dot during the ambiguous learning trials.

Language task. In order to ensure that the children in the two knowledge groups did not differ on their receptive language skills, we administered the Picture Vocabulary subtest of the Test of Language Development–Primary (3rd ed., or TOLD–P:3, Newcomer & Hammill, 1997). On this test, children were asked to point to the picture that represented the word spoken by the experimenter. This test was administered in a standardized fashion. It was found that the receptive language abilities of children in the knowledgeable condition did not differ from that of children in the unknowledgeable condition for either age group (ps > .20).

Results

Children’s Choice of Speaker

Three 2 (knowledge condition: knowledgeable vs. unknowledgeable) × 2 (age: preschool- vs. school-age) univariate analyses of variance (ANOVA) were conducted to examine whether children’s preferences for speakers were impacted by age or knowledge. To avoid violating the assumption of independence of observations, our dependent variables were the proportion of times one speaker type was chosen in each comparison type (see Table 1). Specifically, in the two comparisons involving a sufficient speaker (i.e., sufficient/insufficient; sufficient/inaccurate), the dependent variable was the proportion of times the sufficient speaker was chosen. For the insufficient/inaccurate comparison, the dependent variable was the proportion of times the insufficient speaker was chosen. To determine whether children were showing a preference for one speaker type over another in a given comparison, we compared the proportion of times that type of speaker was chosen to chance (i.e., .5) using single sample t tests. Sufficient/insufficient comparisons. Analyses of children’s sufficient speaker choices, when compared with insufficient speaker choices, revealed a significant main effect of age, $F(1, 78) = 4.13$, $p = .05$, $\eta^2 = .05$, but not age, $p = .12$, nor was there a significant interaction between age and knowledge, $p = .52$. Across the ages, children in the knowledgeable condition (i.e., previously shown the location of the hidden dot) were less likely to choose the insufficient speaker ($M = .52$, $SD = .24$) than children in the unknowledgeable condition ($M = .64$, $SD = .29$).

Follow-up single sample t tests revealed that children in the unknowledgeable condition chose the insufficient speaker more often than chance, $t(40) = 3.00$, $p = .005$, $d = .48$. However, children in the knowledgeable condition did not differ from chance in the proportion of times they chose the insufficient speaker, $p = .59$.

Sufficient/inaccurate comparisons. Children were also presented with a choice between an accurate and an inaccurate speaker (i.e., sufficient/insufficient). Neither prior knowledge regarding the dot location nor age affected children’s choice of a sufficient speaker, $p > .30$. Collapsed across knowledge conditions and age, all children chose the sufficient speaker at greater than chance levels1 ($M = .65$, $SD = .30$), $t(81) = 4.60$, $p < .001$, $d = .50$.

Together the results indicate that when the outcome of the clue is evident (i.e., whether a dot was found or not) children are more likely to choose to solicit information from a sufficient speaker relative to an insufficient speaker. However, school-age children show a greater preference than the preschoolers. Further, all children preferred the insufficient speakers to the inaccurate speakers, particularly when they did not possess prior knowledge of the intended location to which the speakers referred. Consistent with previous work, children preferred accurate speakers to those who demonstrated a history of providing inaccurate information.

Children’s Ratings of Speaker Proficiency

To assess children’s ratings of the speakers’ proficiencies, we conducted a 2 (knowledge condition) × 2 (age) × 3 (speaker type: insufficient, sufficient, or inaccurate) mixed model ANOVA. The dependent variable was the children’s mean ratings of how good each speaker was at helping them find the dots (from 1 (never good) to 3 (always good); see Table 2) across the six times the children experienced that speaker (i.e., across comparison types).2 Significant interactions were followed up with comparisons using a Bonferroni correction (critical values from Howell, 2010).

Analyses revealed main effects of knowledge, $F(1, 78) = 4.12$, $p = .046$, $\eta^2 = .05$, age, $F(1, 78) = 10.11$, $p = .002$, $\eta^2 = .16$, and speaker type $F(2, 78) = 41.83$, $p < .001$, $\eta^2 = .55$, that were qualified by significant interactions between age and knowledge, $F(1, 78) = 5.01$, $p = .028$, $\eta^2 = .06$, and age and speaker type, $p < .01$.1

---

1 Children in each group (i.e., divided into different cells based on age and knowledge) all chose the sufficient speaker at greater than chance levels (all $ps < .01$).

2 Prior to conducting the ANOVA comparisons between the ratings of a particular speaker type in the two different comparisons were made. Children’s ratings for each speaker type did not differ depending on the other speaker that was being compared (e.g., ratings of the insufficient speakers did not differ when these speakers were compared against sufficient versus inaccurate speakers), all $ps > .17$. 

---
CHILDREN’S SENSITIVITY TO INFORMATION QUALITY

Table 1
Means (and SDs) of the Proportion of Times Children Chose Speakers in Study 1

<table>
<thead>
<tr>
<th>Comparisons</th>
<th>Preschool-age children</th>
<th>School-age children</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Knowledgeable</td>
<td>Unknowledgeable</td>
</tr>
<tr>
<td>Sufficient/insufficient</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sufficient</td>
<td>.63 (.27)</td>
<td>.65 (.31)</td>
</tr>
<tr>
<td>Insufficient</td>
<td>.37 (.27)</td>
<td>.35 (.31)</td>
</tr>
<tr>
<td>Insufficient/insufficient</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insufficient</td>
<td>.49 (.23)</td>
<td>.57 (.28)</td>
</tr>
<tr>
<td>Inaccurate</td>
<td>.51 (.23)</td>
<td>.43 (.28)</td>
</tr>
<tr>
<td>Sufficient/insufficient</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sufficient</td>
<td>.61 (.25)</td>
<td>.62 (.30)</td>
</tr>
<tr>
<td>Inaccurate</td>
<td>.39 (.25)</td>
<td>.38 (.30)</td>
</tr>
</tbody>
</table>

Together the results demonstrate that school-age children accurately determined that an insufficient speaker was less proficient at providing information than a sufficient speaker, but the preschoolers did not evidence such a distinction. When knowledgeable, school-age children rated speakers higher overall compared to when unknowledgeable.

Impact of Outcome of Clues

Recall that during the insufficient clue trials, the speakers’ clues did not disambiguate between the potential locations. However, it was still possible for the children to find the hidden dot by randomly choosing the correct location. Not surprisingly, there was no difference in the number of dots found following insufficient clues by school-age (M = 0.35, SD = 0.08) versus preschool-age children (M = 0.38, SD = 0.19; p = .40).

Chi square analyses were conducted to determine whether children’s successful location of the dot on the insufficient clue trials influenced their choice of an insufficient versus sufficient speaker. (As children in the knowledgeable condition were informed about the location of the dot prior to hearing the clue, analyses were only conducted on the choices of children who were unknowledgeable.) To assess the influence of finding the dot, for each of the three sufficient/insufficient comparisons, we created three groups of children based on the number of dots they found following the two insufficient clues in the learning trials (i.e., those who found neither of the dots, one dot, or both dots). Then each group’s speaker choices were assessed. Children who did not find either of the two dots were less likely to choose the insufficient speaker than the sufficient speaker for each of the three sufficient/insufficient comparisons, χ²(1, n = 15) = 5.40, χ²(1, n = 19) = 6.37, and χ²(1, n = 17) = 7.12, respectively, for the first, second, and third

Table 2
Children’s Mean Ratings (SD) of Speakers’ Proficiency Across Comparison Types in Study 1

<table>
<thead>
<tr>
<th>Ratings</th>
<th>Preschool-age children</th>
<th>School-age children</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Knowledgeable</td>
<td>Unknowledgeable</td>
</tr>
<tr>
<td>Insignificant</td>
<td>2.21 (0.51)</td>
<td>2.36 (0.35)</td>
</tr>
<tr>
<td>Significant</td>
<td>2.38 (0.39)</td>
<td>2.46 (0.39)</td>
</tr>
<tr>
<td>Inaccurate</td>
<td>2.20 (0.43)</td>
<td>2.02 (0.52)</td>
</tr>
</tbody>
</table>

$F(2, 78) = 9.56, p < .001, \eta^2 = .11$. No other interactions were significant ps > .19. With regards to the Age × Knowledge interaction, follow-up independent samples t tests demonstrated that school-age children’s responses differed depending on their knowledge state, such that they rated speakers higher when knowledgeable of the dot location ($M = 2.22, SD = .27$) compared with when unknowledgeable of the dot location ($M = 1.90, SD = .39$), t(40) = 2.94, p < .001, $d = .90$. Preschool-age children did not show this differentiation, $p > .88$. When the responses were examined between ages, it was found that knowledgeable school-age children’s ratings did not differ from knowledgeable preschoolers’ ratings ($p = .50$). In contrast, when unknowledgeable, school-age children rated speakers as being less proficient ($M = 1.90, SD = 0.39$) than did preschool-age children ($M = 2.28, SD = 0.25$), t(39) = 3.75, p < .001, $d = 1.17$.

To examine the interaction between age and speaker type, we conducted two repeated-measures ANOVAs for each age group separately. A main effect of statement type for both groups was revealed: preschool-age, F(1, 39) = 6.82, p = .002, $\eta^2 = .15$, and school-age, F(1, 41) = 41.94, p < .001, $\eta^2 = .51$. Follow up paired-samples t tests demonstrated that whereas school-age children rated all the speakers differently from each other, as expected (sufficient, $M = 2.51, SD = 0.42$ > insufficient, $M = 1.95, SD = 0.56$ > inaccurate, $M = 1.70, SD = 0.49$, all ps < .001), preschool-age children’s ratings only differed in the comparison between sufficient ($M = 2.42, SD = 0.39$) and inaccurate ($M = 2.11, SD = .48$; t(39) = 3.23, p = .003, $d = 0.73$; other ps > .05) speakers. School-age children rated insufficient speakers and inaccurate speakers lower than did preschool-age children, t(80) = 3.03, p = .003, $d = 0.68$, t(80) = 3.74, p < .001, $d = 0.83$, for insufficient and inaccurate speakers, respectively. However, there was no difference in children’s ratings of sufficient speakers, $p = .33$. Together the results demonstrate that school-age children accurately determined that an insufficient speaker was less proficient at providing information than a sufficient speaker, but the preschoolers did not evidence such a distinction. When knowledgeable, school-age children rated speakers higher overall compared to when unknowledgeable.
comparisons \((ps < .05)\). In contrast, children who found both dots following the insufficient trials were just as likely to choose the insufficient speaker as the sufficient speaker for all three comparisons, \(ps > .14\). Children who found only one dot following insufficient clues did not demonstrate a consistent pattern. That is, at the first sufficient/insufficient comparison, they were just as likely to choose the insufficient speaker as the sufficient speaker \((p = .32)\), however, at the two later comparisons, they showed a preference for the sufficient speaker, \(\chi^2(1, n = 16) = 6.25, and \chi^2(1, n = 19) = 8.90\), respectively, for the second and third comparisons \((ps < .05)\).

This pattern of results provides evidence that when considering insufficient versus sufficient speakers, children’s decisions regarding from whom to solicit information were influenced by the number of times they located the dot following insufficient clues.

**Discussion**

Preschool and young school-age children were more likely to choose to obtain information from sufficient compared with insufficient speakers in a context where the outcomes of the speakers’ clues were evident. School-age children, but not preschoolers, rated the sufficient speakers as being more proficient than the insufficient speakers. Children did not view the insufficient speakers as being incorrect, though, as they were more likely to choose an insufficient speaker over an incorrect speaker. Similarly, their ratings of the speakers demonstrated understanding that insufficient speakers were better at providing information than inaccurate speakers. Consistent with previous work \(\text{e.g.},\) Koenig et al., \(2004\), children preferred to solicit information from accurate speakers relative to inaccurate speakers.

Children’s prior knowledge of the speaker’s intended meaning was manipulated to determine whether children would conflate their prior knowledge with the semantic content of the clue, leading to greater difficulty in appreciating information quality. Such conflation has been demonstrated in previous work \(\text{e.g.},\) Nilsen et al., \(2008\). Prior knowledge was not found to significantly impact children’s choices between sufficient versus insufficient speakers, although the pattern of results \(\text{albeit nonsignificant}\) was consistent with what would be expected if children’s ability to detect speaker insufficiency was disrupted by prior knowledge \(\text{i.e.},\) with less differentiation of speakers by children possessing prior knowledge. Prior knowledge did significantly affect children’s speaker preferences when judging between an insufficient versus inaccurate speaker. In this context, having prior knowledge of the intended location disrupted children’s ability to differentiate insufficient speakers from inaccurate speakers. Furthermore, when the speaker ratings were examined, there was an overall impact of the knowledge condition with an interaction between knowledge and age. The results suggest that for the older children, having prior knowledge about the dot location leads to higher speaker ratings, potentially due to conflation of their own knowledge with the information contained in the clue. The same pattern was not observed in the preschool-age children who tended to overestimate speaker proficiency in both knowledge states.

In the present methodology, there are two possibilities for what cues children are relying on to determine that a sufficient speaker is preferable to an insufficient speaker. First, it could be that children identified the inadequacy of the insufficient clues and used this information to form impressions of the speakers. Certainly, past research has shown that children are sensitive to the communicative styles of speakers, in that speakers who follow regular morpholinguistic rules are preferred over those who use irregular rules \(\text{Jaswal, McKercher, & VanderBorgh, 2008}\). If children do in fact use their sensitivity to informational adequacy to decide from whom to solicit information, they would be demonstrating impressive communicative competence given that previous research has suggested that children have difficulty detecting communicative ambiguity \(\text{Ackerman, 1981; Robinson & Whittaker, 1985}\) and often attribute the associated failure to the recipient rather than speaker \(\text{Robinson & Robinson, 1978}\). However, another plausible explanation for the results of Study 1 is that children relied on the outcome of the speaker’s clues, namely, whether they found the dot or not. That is, it could be argued that children did not choose the sufficient speaker more often because they understood that this individual provided enough information for the dot to be found, but because they were more successful in finding the dots when provided with clues from sufficient speakers. Indeed, we found that children who did not find the dots following insufficient clues preferred the sufficient speaker, whereas those children who found dots did not differentiate between the insufficient and sufficient speakers. In order to assess whether children actually appreciate the informational adequacy of the speakers, as opposed to the outcome, we needed to assess children’s speaker preferences under conditions where no feedback regarding the success of a clue was provided. Study 2 addressed this issue by examining children’s speaker preference in a context where they did not search for the dot \(\text{and therefore did not experience success or failure}\).

**Study 2**

Children pay attention to outcomes when making judgments about informational sources. For example, 4-year-olds track the relative frequency of errors when deciding who would be a preferred informational source \(\text{Pasquini et al., 2007}\). Furthermore, preschoolers use the reactions of bystanders when deciding on the credibility of speakers \(\text{Fusaro & Harris, 2008}\). Thus, it is likely that children in Study 1 were attending to the outcome \(\text{i.e.},\) whether the dot was found \(\text{in addition to, or rather than, the quality of the speakers’ information to decide that a sufficient speaker was a more helpful informational source than an insufficient speaker. To assess whether children were indeed sensitive to the speakers’ information quality (as opposed to outcome), we assessed children in Study 2 under conditions where the outcome was not observed. Specifically, in Study 2, following each clue, children were not shown whether their choices of the dot location were successful. As the primary question was whether children would prefer sufficient speakers over insufficient speakers, children were only presented with this comparison (as opposed to all three different comparisons of Study 1). If children in Study 2 continued to choose sufficient over insufficient speakers, this preference could be attributed to sensitivity to speakers’ quality of information rather than the outcome.**
Results and Discussion

Speaker quality task. In order to assess whether children showed a preference for one speaker type over another, the proportion of times children chose the sufficient speaker (see Table 3) was compared to chance (.5) using single sample t tests. It was found that school-age children chose the sufficient speaker at a level greater than chance (M = .64, SD = .23), t(21) = 2.81, p = .01, d = 0.61. In contrast, the preschool-age children’s choice of the sufficient speaker (M = .49, SD = .30) did not differ from chance, p = .90. These results suggest that in the absence of feedback regarding the success of the outcome of each clue, preschoolers were not able to solicit information from the most helpful informational source. In contrast, school-age children solicited information from the speaker who provided sufficient information, even in the absence of feedback. However, although there was a trend for the preschool-age children to choose the sufficient speaker less often than did the school-age children, this comparison did not reach significance, t(39) = 1.75, p = .09, d = 0.56.

Children’s ratings of speaker proficiency. A 2 (age) × 2 (speaker type: sufficient versus insufficient) mixed-model ANOVA was conducted with the dependent variable being children’s ratings of how good each speaker was at helping them find the dots (with the same procedures as Study 1; see Table 4).

No significant main effects were revealed, ps > .55; however, there was a significant Age × Speaker Type interaction, F(1, 39) = 10.64, p = .002, η² = .21. Follow-up paired-samples t tests indicated that older children rated the sufficient speakers as being better at providing information than the insufficient speakers, t(21) = 3.47, p = .002, d = 1.11. However, there was no difference in the ratings younger children gave sufficient and insufficient speakers, p = .13. School-age children’s ratings of insufficient speakers were lower than those of the preschool-age children, t(39) = 2.08, p = .04, d = 0.65. Furthermore, school-age children rated the sufficient speakers as being more proficient than did preschool-age children, t(39) = 2.61, p = .01, d = 0.79. Thus, in the absence of feedback, older children demonstrated an appreciation for the quality of information presented by speakers that younger children did not demonstrate.

General Discussion

For knowledge transfer to be maximized, speakers must not only provide accurate information but also good-quality information. Two studies investigated whether children use informational quality as a cue to establish informant preferences. Specifically, we assessed whether children preferred to acquire information from speakers who demonstrated a history of providing sufficient descriptions, relative to speakers who provided insufficient descriptions (as well as whether insufficient speakers are preferred to inaccurate speakers and whether children differentiate between sufficient and inaccurate speakers). In the first study, during exposure to the different speakers, children received information regarding the outcome of speakers’ clues (i.e., whether the clues led to successfully locating the hidden dot), whereas in the second study, children did not receive such information. Several key findings emerge regarding children’s appreciation for the type of information required for successful knowledge acquisition.

First, we found that although both preschool-age and school-age children chose to receive information from sufficient speakers more often than insufficient speakers, the preschoolers’ preferences only emerged when they were aware of the outcomes of the clues (i.e., whether the dot was found). Specifically, in Study 1, both age groups chose sufficient speakers (relative to insufficient speakers) at greater than chance levels. This finding is consistent with previous work demonstrating that 4- and 5-year-olds (but not

Table 4

<table>
<thead>
<tr>
<th>Speaker type</th>
<th>Preschool-age children</th>
<th>School-age children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sufficient</td>
<td>2.44 (0.52)</td>
<td>2.12 (0.45)</td>
</tr>
<tr>
<td>Insufficient</td>
<td>2.11 (0.74)</td>
<td>2.56 (0.33)</td>
</tr>
</tbody>
</table>

Table 3

<table>
<thead>
<tr>
<th>Speaker type</th>
<th>Preschool-age children</th>
<th>School-age children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sufficient</td>
<td>.49 (.30)</td>
<td>.64 (.23)</td>
</tr>
<tr>
<td>Insufficient</td>
<td>.51 (.30)</td>
<td>.36 (.23)</td>
</tr>
</tbody>
</table>
3-year-olds) show modest preferences for speakers who do not violate the Gricean maxim of quantity (i.e., that speakers should provide enough information to make a statement clear; Grice, 1975; Eskritt, Whalen, & Lee, 2008). However, only the school-age children differentiated the sufficient from insufficient speakers with their ratings of speaker proficiency. Furthermore, in Study 2, when children did not have information about the outcome of the speakers’ clues, only the school-age children, and not the preschool-age children, showed a preference for sufficient speakers. Thus, by school-age, children are sensitive to the quality of information that is provided when determining from whom to solicit information. Further, results highlight a developmental progression in children’s use of informational quality as a cue to informant reliability.

However, a key question is why children choose sufficient speakers over insufficient speakers; namely, what inferences do children make of the insufficient speakers? It is possible that children made inferences about the speakers’ knowledge based on external cues (i.e., their success at finding dots following clues from sufficient compared with insufficient speakers). This explanation is plausible given the well-established finding that children demonstrate sensitivity to speakers’ knowledge by soliciting information from more accurate speakers (e.g., Koenig et al., 2004; Scofield & Behrend, 2008). In Study 1, children were less likely to choose the insufficient speaker when there was evidence to suggest that the insufficient speaker may be less knowledgeable than the sufficient speaker (e.g., when children did not find the dots following insufficient clues). In this situation, children may have inferred that the insufficient speaker did not know where the dot was. In contrast, when it was less clear as to whether the knowledge states of the sufficient and insufficient speakers differed (e.g., when children found the dots following insufficient clues), the children had more difficulty differentiating between sufficient and insufficient speakers. The preschool-age children appeared to be relying solely on these external cues (i.e., their success at finding dots) as opposed to attending to the quality of the message itself. For instance, in Study 2, when the children were not provided with external cues that allowed for inferences regarding speaker knowledge (i.e., they did not know where the sticker was hidden and were not provided with the outcome), the preschoolers were just as likely to choose the sufficient speaker as the insufficient speaker. The pattern of data fits with the explanation that when children are provided with the outcome of speakers’ clues, they make inferences regarding speakers’ knowledge and subsequently base their speaker preferences on these inferences. However, the methodology does not allow for ruling out a nonempirical explanation for children’s preferences (e.g., that children feel more positive about a speaker who leads them to greater success).

The second possibility for why children chose sufficient speakers over insufficient speakers is that the children were sensitive to the quality of speakers’ information and used this sensitivity to form speaker inferences. Indeed, the school-age children (but not preschoolers) showed a preference for the sufficient speakers over insufficient speakers even when the knowledge of the speakers was less obvious from the context, leaving them to rely solely on the speakers’ clues. Specifically, even without information regarding the outcome of the clue, older children chose the sufficient speakers over the insufficient speakers and rated each of the speakers appropriately (i.e., the sufficient speaker as more helpful than the insufficient speaker). In this context, older children were able to rely on the quality of the information itself, likely due to their ability to detect communicative ambiguity, a skill that emerges at this age (Nilsen & Graham, 2012) and continues to develop throughout the school-age years (Lloyd, Mann, & Peers, 1998). Results suggest that school-age children are sensitive to the semantic content of the speakers’ statements, in that they were able to evaluate the speakers’ clues against the contextual backdrop in which they occurred (i.e., as the sufficiency of the clue depended on the stimuli presented). Moreover, we observed the older children demonstrating the application of this important communicative skill (i.e., detecting communicative ambiguity) to form speaker preferences. This being said, how children used, or made sense of, this information when evaluating the speakers cannot be determined from the current methodology. For example, it may be that the older children used communicative clarity as a sophisticated means to further determine the speakers’ knowledge state (e.g., Speakers who provide sufficient descriptions are more knowledgeable), or it may be that the older children preferred speakers who used unambiguous language because they appreciate that there is more information contained in sufficient statements (e.g., Sufficient statements are more likely to provide me with information I need). Regardless, it appears that sensitivity to message quality allows the older children to differentiate between the speakers and that this is a sensitivity that is not possessed by the younger children. There are a number of cognitive developments that could be supporting the increased ability to evaluate information quality. For example, it may be the case that increased executive functioning facilitates the older children’s ability to detect insufficiency in communication. Certainly, recent work has found that children who possess better executive function skills are more able to appreciate when language is ambiguous (Gillis & Nilsen, 2012; Nilsen & Graham, 2012).

These findings contribute to a growing literature focusing on how children selectively acquire information from others. We found that children rely on informational quality as a cue to assess the credibility of speakers. However, compared with other cues that children use to assess speaker credibility, information quality seems to come on-line at a later age (e.g., compared with speaker accuracy, which children as young as 24 months rely on; Koenig et al., 2004; Koenig & Woodward, 2010). While much of the previous research has focused on children’s attention to the characteristics of the speakers (e.g., age, knowledge, and accuracy; Birch et al., 2008; Jaswal & Neely, 2006; Koenig et al., 2004), this work adds to the handful of studies demonstrating that children are also sensitive to the process by which information is delivered when determining speaker preferences. For example, past research has demonstrated that children prefer speakers who use confident nonverbal cues (Birch et al., 2010; Tenney et al., 2011) and preschoolers prefer speakers who use the expected past tense for words (Jaswal et al., 2008). Here we find that the quality of information affects children’s evaluations of the informant, at least by school age.

A second finding was that prior knowledge of the location of the dot affected some, but not all, speaker choice comparisons and affected school-age children’s speaker ratings. Specifically, although the pattern of data was consistent with the notion that prior knowledge would disrupt children’s ability to differentiate sufficient from sufficient speakers, the effect of knowledge did not...
reach significance. Prior knowledge did influence children’s preferences between insufficient and inaccurate speakers. That is, when not informed about the location of the dot, children of both ages showed a preference for an insufficient speaker versus an inaccurate speaker. However, children who were informed about the location of the dots prior to hearing the speakers’ clues responded at chance levels when deciding between insufficient versus inaccurate speakers. It may be the case that children relied on their prior knowledge as opposed to the information in the clue during these comparisons, thereby disrupting their ability to differentiate between speakers. Alternatively, it may be that prior knowledge allowed children to develop an expectation for the type of information the clue should contain. Violations of this expectation, whether it is due to insufficiency or inaccuracy, may be treated as an indication of an unknowledgeable informant, thereby leading to no differentiation.

The speaker ratings revealed a significant effect of knowledge that was qualified by an interaction between knowledge and age. The school-age children who possessed prior knowledge were more likely to rate speakers as providing good messages relative to children who did not have prior knowledge. This result is consistent with previous literature demonstrating that children have difficulty with explicitly detecting communicative ambiguity when provided with prior information about the intended meaning of a statement (e.g., Nilsen et al., 2008; Sodian, 1988). There was no significant effect of knowledge for the preschool-age children. However, this lack of effect emerged because preschoolers tended to overestimate the proficiency of the speakers even when not knowledgeable (i.e., they rated the speakers higher than school-age children when not knowledgeable of the clue location).

Although not a direct test of children’s use of information quality as a cue to speakers’ credibility, the comparison between accurate (i.e., sufficient) and inaccurate speakers has implications for the speaker reliability literature. Specifically, in previous studies, children encountered inaccurate speakers (e.g., those who provided an incorrect object label) were aware of the inaccuracy at the time that the speaker spoke (i.e., children knew the correct label for the object). Therefore, children had a sense of the speaker’s credibility as soon as the verbal testimony was provided. In our first study, however, children were not aware of the speakers’ accuracy until after performing a search. This scenario more closely parallels children’s everyday experiences in that, often, children are exposed to novel information without immediately knowing the validity of the speaker’s statement. Children of both ages showed a clear preference for the sufficient speakers, suggesting that children do not need to form immediate appraisals of speakers. Rather, judgments about speaker reliability can be formed by receiving subsequent information after the speakers provide their testimony. These findings add to recent work demonstrating that children can track speakers’ credibility over time and update their appraisals accordingly (e.g., Scofield & Behrend, 2008).

In conclusion, children show a preference for learning from speakers who provide sufficient information relative to speakers who provide insufficient information. We hypothesized that preschoolers relied on external information (e.g., outcome of the information) to infer that insufficient speakers were less knowledgeable and, accordingly, less preferred. However, when this external information was not provided, their ability to infer knowledgeable was disrupted, and they were therefore not able to distinguish sufficient speakers from insufficient speakers. In contrast, the school-age children were able to rely on the quality of the information itself (likely due to greater ability to detect communicative ambiguity) to form preferences about the speakers. These children’s sensitivity to the quality of information allowed them to rely on the speakers who provided the greatest chance for successful acquisition of knowledge.

References


