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Evidential Morphology and Theory of Mind

Anna Papafragou and Peggy Li
University of Pennsylvania and Harvard University

1. Introduction

The perennial fascination with the relationship between language and thought has generated much research across various disciplines. In recent years, commentators have called for closer examination of the connection between language acquisition and conceptual development (Bowerman & Levinson, 2001). Rather than assuming that language development always presupposes cognitive development, several researchers have started considering whether language learning could transform conceptual structure by making certain concepts available to the learner (e.g., de Villiers & Pyers, 1997; Gopnik & Choi, 1995; Bowerman, 1996).

It has been suggested that linguistic categories might reasonably have cognitive consequences in domains far removed from perception, involving higher-level cognitive processing, where human cognitive representations appear to differ from those of other animals (Gentner & Boroditsky, 2001; Spelke & Tsivkin, 2001). The ability to attribute mental representations to oneself and to others, widely referred to as *theory of mind*, has been considered by many a promising arena for exploration of such effects (Carruthers, 1996; de Villiers & de Villiers, 1997). In this paper, we focus on one aspect of language and its potential effect on theory of mind development. Specifically, we examine the developmental relationship between children's ability to reason about evidence for their own beliefs and the beliefs of others and the acquisition of *evidential* vocabulary.

Human beings routinely make use of a variety of evidential sources in acquiring beliefs about the world (these sources include, e.g., direct perception, communication and inference). Humans also possess the ability to understand the connection between evidence and consequent effects on knowledge states. This ability is useful in tracking the pieces of evidence that led to the formation of a belief, assessing the reliability of a belief, and ultimately arriving at a set of

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correct beliefs. Knowing what type of evidence led to a belief plays an important role in belief evaluation and belief change. We evaluate the sources of information of a person when considering whether to believe what he or she says. If an informant has not been an actual witness of an event and we have, we are prone to believe what we have seen with our own eyes over what that person tells us if our accounts conflict. We also typically reconsider and modify past beliefs due to new evidence. Failure to evaluate sources of information could lead to incorrect beliefs, a fact that could have dire consequences. Therefore, being able to account for and reason about evidential relations and sources is an essential part of human theory-of-mind abilities.

Languages provide the means for describing evidential relations through a variety of lexical or syntactic resources. Speakers often reveal how they arrived at a certain knowledge state. For example, “I saw John eating the pie” indicates that the speaker had first-hand access to the eating event, while a slightly different utterance, “I saw that John ate the pie”, does not. The latter utterance could reflect an inference on the part of the speaker, perhaps from seeing John’s mouth covered in blueberry. At other times, speakers when making a statement convey information about their attitude towards that statement, for instance their degree of certainty (cf. “I know John ate a pie” vs. “I think John ate a pie”). The linguistic elements indicating the informational source of a statement (perception, inference, or hearsay) and/or the speaker’s certainty or commitment to a statement (strong or weak) are known as *evidentials*. Logically, the use of evidentials requires a sophisticated ability to reflect upon and assess the knowledge states of oneself and others.

In what follows, we first lay out what is known about children’s ability to reason about the causal origins of their beliefs. Second, we examine the time course of the acquisition of evidential terms in various languages in order to confirm that linguistic development is constrained by and compatible with cognitive development. We go on to report our preliminary results from (a) the acquisition of evidential markers in Korean, and (b) the development of early evidential reasoning in Korean-speaking and English-speaking children. Lastly we discuss certain interesting issues about the relationship between cognitive and linguistic development raised by our data.

1.1. Development of Evidential Reasoning

Some understanding of evidential relations is in place by the age of three. Children of this age have demonstrated that they understand that seeing leads to knowing (Pillow, 1989; Pratt & Bryant, 1990): three-year-olds tend to select the character who had visual access to an object hidden inside a box as the one who knows what is hidden inside the box over another character who simply lifted or pushed the box.

However, three-year-olds (unlike four-year-olds) are typically characterized as poor at identifying or explicitly reporting the source of their beliefs (Whitcombe & Robinson, 2000). O’Neill and Gopnik (1991) asked preschoolers

to identify an item hidden inside a tunnel either by feeling it, looking at it, or being told what it is by the experimenter. The preschoolers were also asked: "How do you know what's inside the tunnel? Did you see it, did I tell you, or did you feel it?". Although children could correctly identify the mystery item inside the tunnel, three-year-olds failed at justifying how they figured out the content of the container. Only by four years were children able to reliably identify the sources of their beliefs.

1.2. Acquisition of Evidentials

In English, evidential relations are sometimes conveyed with mental state and perception verbs (e.g., *know, think, guess, see, look, hear*), epistemic modals (e.g., *must, may*), and adverbials (e.g., *allegedly, or reportedly*). Although in English mental verbs and epistemic modals appear in the speech of children under three, they are often used as conversational hedges (cf. phrases such as *you know, or I think*; Shatz, Wellman, and Silber, 1983). Other studies have reported that children are only able to make distinctions of the relative certainty of/commitment to a proposition (*know vs. be sure, think vs. guess*) at four years (Moore, Bryant, and Furrow, 1989; Moore and Davidge, 1989). Thus it is generally assumed that it is around the age of four that children develop a fuller understanding of epistemic modality and mental state verbs (for a review see Papafragou, 1998; in press).

Other languages use a class of specialized grammatical morphemes to mark evidential relations (Lee, 1993). We will focus on two such languages, Turkish and Korean, for which there is some evidence about the acquisition of these grammaticalized evidentials. In Turkish, past tense verb forms require one of two obligatory markers (*-di* and *-miş*) to indicate whether the speaker had direct or indirect knowledge of the past event. As an example of how the two suffixes work, contrast utterances "Ahmet gel - di" and "Ahmet gel - miş". Both relay the information "Ahmet came." The choice of *-di* in first utterance indicates the speaker was an eyewitness of the event. The choice of *-miş* indicates that the speaker only had indirect evidence of the event through either inference or hearsay.

Aksu-Koç (1986) studied the acquisition of these two Turkish evidentials. She found that three-year-olds showed trends of differentiating their use of the two suffixes. The children preferred *-di* for directly perceived events and *-miş* for inferred events when describing illustrated stories or puppet shows. After 3;8, the reliability of the differentiation increased considerably and did not differ significantly from her oldest sampled children (six-year-olds). In comprehension tasks where children were asked to judge whether a puppet had seen an event on the basis of the suffix he used to describe it, most children under four failed the task, while most children over four were successful.

Aksu-Koç's results and the data on English seem to suggest that the developmental time course of evidentials is in accordance with the cognitive development literature -- in other words, the use of evidentials develops

alongside children's increasing sophistication in reasoning about people's knowledge states. In this context, we turn to some puzzling data from Korean. Korean, like Turkish, has an obligatory system of evidential morphemes that is part of a larger class of sentence-ending (SE) morphemes. Various researchers (Choi, 1995; Lee, 1990) have studied the acquisition of these morphemes using corpus and diary data. They have shown that several of the evidential morphemes are acquired extremely early. The most common of the morphemes, *-e*, is a declarative marker that is used to mark *direct evidence* and *old* information already assimilated into the conversation. It first appears in children's speech around 1;9. The declarative counterpart for *direct evidence* that marks *new* unassimilated information is *-ta* and appears in child speech at approximately the same time as *-e*. Around two years and certainly by age three, children use *-e* and *-ta* contrastively to mark the degree of assimilation of knowledge in the mind of the speaker. Another marker is the hearsay morpheme *-tay*, which appears before 2;5. Children use this quotative marker reliably in contexts of reporting what a third party has said. Other early markers include *-ci*, which marks the certainty of a proposition, and *-kwun*, which marks inferential access to information.

By the time the children reach the age of three, they are using many of these SE morphemes productively (Choi, 1995). These data raise the following question: How is it that Korean children acquire these morphemes so early, earlier than children learning very similar morphemes in Turkish? Choi argued that since these SE morphemes are grammatically obligatory in the language, they are thus frequent in the input. Additionally, being at a sentence-ending position, they are also perceptually salient for the children learning them.

2. Motivation for a Closer Look

Language development has often been used as a window onto children's cognitive development. One might be inclined to take the early production of the Korean evidentials as unequivocal evidence that Korean children have mastered evidential reasoning by the age of three. If so, Korean children will turn out to be far more advanced than their English-speaking peers in terms of their ability to report evidential relations. On this view, Choi's Korean data could be the first step in showing that linguistic input can drive conceptual development.

One problem for taking production evidence alone seriously, however, is that production of these markers cannot be equated with true understanding of their meanings. Some evidence for this comes from the fact that some of the earliest uses of these morphemes co-occur only with certain verbs. For example, *-ta* occurs extremely frequently with the verbs *iss-* "to exist" and *eps-* "to not exist" in child language. These same uses are frequent in comments like *yepu-ta* ("so pretty") or *mas-iss-ta* ("so tasty") in parental speech. The uses of these morphemes in child Korean could therefore potentially draw on unanalyzed memorized phrases in the children's lexicon - in which case children would lack

any genuine understanding of these morphemes. One would then want to ask what meanings children attribute to the early uses of these morphemes, and whether these meanings are the same as the adult semantics.

Given the intriguing Korean linguistic data, there are (to reiterate earlier points), two questions we need to address. First, is it true that the presence of obligatory and salient evidential markers pushes Korean children to learn how to evaluate the sources of their beliefs at an earlier age than English-speaking children? Second, have Korean children really attributed the correct meanings to these evidential morphemes, as observational evidence suggests? In the sections to follow, we report preliminary results from an ongoing series of studies which are centered around these questions.

To address the first question, we compared Korean- and English- speaking children in their ability to reason about the sources of beliefs (we will refer to these tasks as our *nonlinguistic* tasks). We focused on two sources of information that could lead to knowledge: (visual) perception and communication. For our purposes, we adapted standard tasks from O'Neill and Gopnik (1991) and Pratt and Bryant (1990). Recall that O'Neill and Gopnik's experiments asked whether children can identify the source of their own beliefs, and Pratt and Bryant's experiments asked whether children could reason about the knowledge state of others. Since the correct use of the Korean SE suffixes often requires not just monitoring one's knowledge state, but also the mental states of others (in evaluating, for instance, whether a piece of evidence is available to another person), we decided to test both aspects of evidential reasoning.

To address the second question, we devised a linguistic comprehension task inspired by Aksu-Koç's (1985) study. As an initial step, we only examined the acquisition of two suffixes, *-ta* and *-tay*. Recall that *-ta* refers to firsthand, new, unassimilated information. On the other hand, *-tay* is a quotative marker used in cases of reporting new, unassimilated information heard from another source. As Choi (1995) pointed out, "*-ta* contrasts with *-tay* in marking a proposition as reflecting the child's direct experience." (p. 198). These two suffixes are related to the specific sources tested in the nonlinguistic tasks. Specifically, *seeing* is a direct source of evidence and *being told* is an indirect source.

3. Experiment 1: Nonlinguistic Tasks

In this first experiment, we compared the developmental progress of Korean- and English-speaking children's ability to identify the source of beliefs. Sixty-four children participated in the study. They were tested individually. Half of the children were monolingual speakers of English and were recruited from schools in Philadelphia, while the other half were monolingual speakers of Korean and were recruited from schools in Seoul, Korea. For each language group, 16 three-year-olds and 16 four-year-olds participated.

3.1. Experimental Design

A dollhouse with eight places (e.g., drawer, refrigerator) in which items (e.g., plate, slippers) could be hidden served as the stage for the game the children played with the experimenter. A different item was hidden in each of the eight places prior to the arrival of the child participant. Two puppet characters (Mickey and Donald) acted in the experimental stories; they were chosen so as to be familiar to both Korean and American children.

Upon arrival, children were introduced to the two characters and were told they would play a game to reveal items hidden in secret places. Two different tasks (the “Others” task and the “Self” task, described below) were administered to each child during the test session. A familiarization phase preceded the two tasks. The content and nature of the questions during the familiarization was unrelated to the questions for the other two tasks, but served to establish that the child was willing to name items shown to him/her, and to choose between two characters (Mickey or Donald) when given a forced choice question. For example, after viewing an enacted scene of Mickey eating a pizza on a table and Donald combing his hair, the experimenter would ask, “Who ate a pizza?”.

Once the child answered these warm-up questions, which were fairly easy for all children, the experimenter went on to the Others task (adapted from Pratt & Bryant, 1990). In one condition (the *Looking* condition), one of the characters would look into a secret hiding place (e.g., cabinet) and one would knock on it. Then the child had to determine which character knew what was hidden inside the secret place (i.e., “Who knows what is in the cabinet? Mickey or Donald?”).

In another condition (the *Telling* condition), the experimenter spoke to one of the two characters and indicated her intentions to convey the contents of a secret hiding place by beginning an utterance (e.g., “In the cabinet, there is a...”). However, instead of finishing the message out loud, she pretended to whisper the rest of the message into the character’s ear. For the other character, the experimenter also began with an utterance, “I am going to give you a kiss.” Then she proceeded to kiss the character. As in the Looking condition, the child had to determine which character knew what was hidden in the secret place. Each child received two Looking and two Telling trials.

The Self task (adapted from O’Neill & Gopnik, 1991) taps into children’s ability to assess the causal origins of their own beliefs. Again, there were two source conditions involving looking and telling. The child was either told about or saw for himself what was in a secret hiding place. The experimenter then probed the child for the identity of the item (“What is in the cabinet?”). After replying, the child was then asked how he/she knew (“Did you look? Did I tell you?”).¹

1. Our instructions purposefully differed from previous studies (O’Neill & Gopnik, 1991; Whitcombe & Robinson, 2000). In those studies, experimenters typically first posed the question, “How do you know?” and only further prompted with the specific questions of source (“Did you look? Did I tell

3.2. Result Summary

We found a significant age difference between three- and four-year-old English-speaking children. In accordance with previous studies, our three-year-olds were relatively poor (chance level) at reporting the sources of their beliefs for the Self task. They were equally poor, if not worse, at reasoning about informational access and the subsequent knowledge state of others on the Others task.² By four years, English-speaking children reliably pass the test questions.

As for the Korean children, there was only a small age advantage for the four-year-olds. This is because the three-year-olds were already answering the test questions correctly. Whereas English-speaking three-year-olds were at chance, their Korean peers were correct on nearly 90% of the test questions. No significant difference was found between the Looking and Telling conditions.

4. Experiment 2: Linguistic Task

4.1. Experimental Design

In this experiment, we used a comprehension task to assess the understanding of the evidential markers using the same Korean children who had previously participated in our Nonlinguistic study. As in the Others task, children were asked to select one of two puppets for their response. In this task, we used four decorative containers, each with a secret toy inside. For a given trial, we introduced the child to two puppets (e.g., Goofy and Daisy) and one of the decorative containers. The child was told to listen carefully to the puppets. Standing next to the unopened container, both puppets verbally revealed its content (e.g., “There is a ball in the box”). The verbal utterances of the two puppets were identical except for the chosen SE evidential morpheme. One puppet used the *-ta* marker (i.e., the Korean equivalent of “There is a ball in the box-ta”) and one used the *-tay* marker (“There is a ball in the box-tay”). In the Looking trials, the experimenter made it clear that only one of the puppets had seen what’s in the box and asked the child: “Who saw what’s in the box? Goofy or Daisy?”. In the Telling trials, the experimenter said that she had told

you?”) when the child failed to respond. Pilot data suggested that children did not seem to understand the “How do you know?” question. Since the majority of the three- and four-year-olds in the other studies required further prompting anyway (see Whitcombe & Robinson, 2000), we decided to drop the introductory question.

2. Our results differ from the findings in Pratt & Bryant (1990) or Pillow (1989), according to which three-year-olds succeed at a similar task. The amount of pre-training or the difference in instructions could have contributed to the higher failure rate of our three-year-olds. Results close to our own were obtained by Robinson, Champion & Mitchell (1998): they found that three-year-olds performed poorly if asked “Who knows best?”, when one character had informational access leading to knowledge while the other did not.

one of the puppets what was in the box and asked: “Who did I tell what’s in the box? Goofy or Daisy?”. Each child received two Looking and two Telling test trials. If the child had genuine understanding of the two morphemes, then he/she should be able to pick the *-ta* puppet as the character who had looked in the box and the *-tay* puppet as the character who had been verbally informed about its contents.

4.2. Result Summary

According to pilot data, adult native Korean speakers find such a task easy and clear. However, unlike adults, the same children who could pass our nonlinguistic evidential task were now at chance in selecting the correct puppet. The percentage correct for the four-year-olds was higher than that for the three-year-olds, but still not different from chance. Both groups of children showed slightly better performance for the Telling questions, but again the trend is not significant.

5. General Discussion

Our experiments have shown that Korean-speaking children are better than English-speaking children on nonlinguistic evidential tasks, but fail on tasks tapping linguistic evidentiality. This is an intriguing finding. In this section, we present some thoughts about the results of our studies and point to our ongoing research which extends and develops these themes.

Even though these data are still preliminary, they raise an obvious question: How is the Korean-English difference to be explained? In recent literature, commentators have suggested several ways in which language use could potentially affect the thoughts of speakers (e.g., Hunt & Agnoli, 1991; Gumperz & Levinson, 1996). One possibility is that the lexical resources of one’s language could affect the conceptual organization of its speakers. Another, perhaps more relevant, possibility is that the way a language encodes and packages conceptual material could have implications for the nature and computational efficiency of the reasoning processes of its speakers. For example, one might argue that the obligatory and efficient way in which evidential morphemes mark evidential relations in Korean might affect how speakers conceptualize evidential relations. The fact that, in our experiments, Korean children fail to understand the relevant set of evidential morphemes and yet succeed at relevant nonlinguistic tasks offers no support for these accounts. Our results suggest minimally that children’s knowledge of the semantics of these particular suffixes is not responsible for their success on the linguistic task (and so thinking in one’s language is not what is responsible for their success either).

How then is the superior performance of young Korean learners to be accounted for? One possible explanation is that the consistent co-occurrence of a morpheme with a certain situation (e.g., *-tay* with reporting what someone has

said) and the contrast with other morphemes (e.g., *-ta*) could potentially lead Korean children through cross-situational analysis to learn about informational access and its effect on knowledge. Another possibility is that very young American children in fact do have the ability to reason about informational access and its consequent effects. Many recent studies suggest that, although children are bad at explicitly reporting their reasoning about mental states, they nonetheless behave as if they are reasoning correctly (e.g., Robinson, 1999; Garnham & Perner, 2001). Perhaps the failure of our English-speaking three-year-olds is not tied to their reasoning but to their ability to report on informational access. Constant obligatory use of evidential morphemes in languages which have this grammatical option may sharpen this reporting ability. As the old saying goes, “practice makes perfect.”

We are currently expanding on the studies reported here in a number of directions. We would like to increase our sample size, especially since there is evidence for individual differences in some theory of mind tasks (Jenkins & Astington, 1996; Ruffman, Perner, & Parkin, 1999; Robinson, Mitchell, & Nye, 1995 as reported in Robinson, 1999). We also want to probe further into early linguistic knowledge of evidentiality in Korean. Even though we believe that our present linguistic task is simple (and adult Koreans, as we mentioned, agree with us), it might be that it underestimates the semantic knowledge of our young Korean learners. Perhaps the task of remembering and comparing two utterances which differ minimally from each other is hard for children of this young age. In further studies which are now under way, we introduce additional controls and a new (and simpler) language comprehension task. As this research develops, we expect to enrich our understanding of both the acquisition of linguistic evidentiality and its relationship to children's growing cognitive resources.

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