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## Children's understanding of linguistic expressions of certainty and evidentiality

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Informants are not always trustworthy or knowledgeable. Therefore, it is no surprise that every language has means to indicate how the speaker acquired a piece of information, as well as means to indicate how certain the speaker is about the information he is describing. The former are often called expressions of evidentiality and the latter are called expressions of certainty. Currently, however, little is known about how and when children acquire those expressions, and how acquisition of those expressions interacts with conceptual understanding of information source and trustworthiness of informants. The aim of this chapter is to shed some light on the issues by looking into cross-linguistic differences and similarities in acquisition of grammaticalized expressions of certainty and evidentiality.

### 1. Introduction

For a recipient of socially transmitted information, it is essential to be capable of assessing its reliability in order to avoid being misled. If someone says he witnessed a car accident, the police will take his statement very seriously. But if the same person expresses uncertainty about his own statement, what he says will not be regarded as solid evidence. Given the social nature of our communication, it is no surprise that every language has means to indicate how the speaker acquired a piece of information, as well as means to indicate how certain the speaker is about the information he is describing. The former are often called expressions of evidentiality and the latter expressions of certainty.

In some languages, such as English and German, evidential expressions are encoded lexically with expressions such as “I saw” or adverbials such as *allegedly*. In other languages, for example, Tibetan and Turkish, they are expressed by grammaticalized morphology, such as verbal affixes and particles. These are called evidentials. Unlike lexical expressions of knowledge sources by which potentially

anything can be described as the source, evidentials, which exist in one-quarter of the languages in the world, refer to only a limited set of knowledge sources such as personal experience, direct (visual) evidence, indirect (hearsay) evidence and inference (Aikhenvald, 2004). In some languages such as Turkish and Bulgarian, grammaticalized evidential marking is obligatory while it is optional in other languages such as Japanese and Quechua. In Korean, it is obligatory in conversation but not used in written discourse.

Certainty can also be expressed via open-class lexical items such as “I think” or *definitely*, or closed class items such as *may* or *must*. When lexical items such as “I think”, “I suppose” and “I bet” are used to express speaker certainty, they are often called epistemic markers, or “parentheticals”, i.e. linguistic items that lack a structural relation to the main utterance (Dehe & Kavalova, 2007).

According to classic accounts, both speaker certainty and evidentiality are considered to be a part of a broader category of epistemic modality (e.g. Palmer, 1986; Chafe, 1986; Chafe & Nichols, 1986), but today it is widely agreed that evidentiality and epistemic modality are two conceptually distinct categories (De Haan, 1999; Faller, 2002). It cannot be emphasized enough, however, that they are also closely related. For example, if someone says she has direct evidence of something, we tend to assume that she is highly certain about it. Alternatively, if the speaker only has indirect (hearsay) evidence, we typically assume that the speaker is not confident about the truthfulness of the reported event. Furthermore, we have a tendency to trust a person whose claim is based on direct evidence more than a person whose claim is supported only by indirect evidence, by hunch, or by pure imagination. Thus, the following scale has been suggested to represent a mental hierarchy of quality of evidence we prioritize in order to assess trustworthiness of the information:

Personal experience > Direct (sensory) evidence > Indirect evidence > Hearsay  
(Davies et al., 2007)

This hierarchy indicates that we tend to trust information on the basis of personal experience (based on privileged access to one’s own state of mind or body) most and the hearsay information least. Of course, our actual assessment of the speaker’s trustworthiness depends on various other factors (e.g. the speaker’s general intelligence and past reliability) so the scale should not be taken as a rigid rule. Still, it is quite reasonable to assume that our assessment of quality of evidence and speaker’s knowledge and trustworthiness in daily communication are very closely related.

What is encoded by both epistemic modals and evidentials is typically considered to make no contribution to the truth-condition of the basic-level proposition, i.e. the proposition expressed in the utterance. Rather they make their own

contribution to a higher-level proposition (de Villiers et al., 2009; Matsui, 2000; Itani, 1998; for an alternative approach, see Faller, 2007; Garret, 2000; Papafragou, 2006).

A number of developmental studies have demonstrated that children's acquisition of expressions of certainty and evidentiality are closely related to development of other cognitive capabilities including theory of mind, source monitoring ability, and evaluation of reliability of information. In this chapter, therefore, after reviewing cross-linguistic studies on children's semantic acquisition of epistemic and evidential markers, I will discuss studies that investigate the language-cognition interface regarding children's understanding of certainty and evidentiality, namely understanding of reliability of information and source monitoring. I will end the chapter with suggestions for future research directions.

## **2. Cross-linguistic variations in children's production and comprehension of epistemic and evidential markers**

Here I will review the existing studies on children's acquisition of epistemic and evidential markers, focusing on English, Japanese, Cantonese, Korean, Turkish, Tibetan and Quechua. English, in which only a few epistemic markers are grammaticalized, was chosen to be included in the review to make a contrast with languages with more or fully grammaticalized equivalents. For information about the acquisition of lexicalized epistemic and evidential markers in languages other than English, please refer to other literature including Bassano (1983); and Bassano, Hickmann, & Champaud (1992) for French; Bascelli & Barbieri (2002) for Italian; Ifantidou (2005) for Greek.

Naturalistic data is useful to investigate spontaneous productive use of epistemic and evidential markers. In general, existing acquisition studies based on naturalistic data tend to show (a) that not all epistemic and evidential markers are acquired at the same time, and (b) that several factors such as frequency of input, linguistic complexity, and cognitive complexity appear to contribute to the acquisition of these markers.

As a child's use of these markers does not necessarily entail full adult-like understanding, experimental methods are also used to examine exactly which aspects of meaning children can or cannot understand at a particular point of development. Moreover, often it is only through experimental testing that development in children older than 3 can be examined. Existing experimental studies on comprehension of epistemic and evidential markers indicate (a) that understanding of encoded speaker certainty develops during the preschool years, a couple of years earlier than understanding of encoded source of knowledge, and

(b) that among evidential particles, understanding of indirect evidence and hear-say develops later (not until about 6 years of age) than awareness and understanding of direct evidence markers.

The two research methods are complementary, as in any other investigation of language development. Experimental investigation of children's production and comprehension of epistemic and evidential particles is essential to further distill naturalistic data implications. In the following section, I will first review naturalistic studies on production of epistemic and evidential markers, which will be followed by a brief review of experimental studies on production and comprehension of these markers. Note that experimental studies investigating children's use of epistemic and evidential markers to understand the reliability of information or the trustworthiness of the speaker will be reviewed in a separate section. Studies on the connection between children's understanding of source of knowledge and acquisition of evidentials are also reviewed separately.

## 2.1 Naturalistic data

*English.* In theory of mind research, English-speaking children's production of mental state verbs such as *think* and *know* has been considered a strong indicator of their understanding of other's mental states (e.g. Bartsch & Wellman, 1995). By contrast, no systematic investigation has been carried out on English-speaking children's understanding of evidentiality, as linguistic marking of knowledge source is rarely found in naturalistic data of child conversation.

Functional analyses of children's use of mental state expressions revealed that they can also be used as expressions of speaker certainty or uncertainty (Shatz, Wellman, & Silber, 1983; Diessel & Tomasello, 2001). Shatz et al. (1983) used the term 'modulation of assertion' to categorize uses of mental state verbs to express speaker uncertainty such as *think* and *know*, and observed that English-speaking children start using them to modulate assertion as early as age 2;8. Limber (1973) pointed out that such uses of mental state verbs are typically characterized as 'parenthetical' (see also Aijmer, 1997; Thomson & Mulac, 1991; Urmson, 1963), and are used as a type of epistemic marker. Limber's observation has been confirmed by more recent analyses. For example, Bloom et al. (1989) have concluded that English-speaking children first learn *think* and *know* in order to express varying degrees of certainty regarding the content of the complement proposition. Also, Diessel and Tomasello (2001) found that all 3 children they analyzed used *think* initially in the parenthetical formula *I think*, which they claim serves as an epistemic marker with a meaning similar to an epistemic adverb such as *maybe*. There seems to be a consensus that children begin to use *think* to express uncertainty before they reach the age of 3.

Although not focusing on the concept of speaker certainty as such, studies investigating acquisition of English modal auxiliaries and adverbs also add to our knowledge of how children acquire sensitivity to the concept of certainty. A general consensus in this area, with both naturalistic and experimental approaches, seems to be that children start using modal auxiliaries to express epistemic modality sometime around 3;6 or 4, i.e., not until a year or so after they begin using them to express deontic modality (which deals with obligation, necessity, permission, etc.) (see Shatz & Wilcox, 1991 and Papafragou, 1998 for a review). However, it has also been observed that children start expressing uncertainty first by using modal adverbs such as *maybe*, starting to use modal auxiliaries such as *may* or *might* for the same purpose. Surprisingly little is known about how English-speaking children acquire modal adverbs, but a number of studies collected in Nelson (1989) report that one child called Emily used the adverb *maybe* frequently in her monologues before the age of 3. More recently, O'Neill & Atance (2000), who studied the use of *maybe*, *probably*, and *might* by ten children, reported that of the three, *maybe* was the most frequently used term between the ages of 2;0 and 4;5. They concluded that English-speaking children start expressing epistemic modality when they are 2 years old, much earlier than when they can do so by using modal auxiliaries.

*Japanese.* In Japanese child-directed speech, speaker certainty and evidentiality is most often expressed through sentence-final particles (Clancy, 1985). Shirai, Shirai, and Furuta (1999) look at the acquisition of Japanese sentence-final particles as observed in longitudinal data from four children up to the age of 3. According to these data, the onset of *yo* (certainty) occurs at about 18 months. The onsets of *kana* (uncertainty) and *tte* (hearsay evidential) occur at roughly the same time, between 24 and 30 months of age. Shirai et al. also looked at one mother's use of these particles, and reported that early acquisition of *yo* seemed to have been affected by frequency of input, but that no correlation was found between the mother's input and the timing of the acquisition of either *kana* or *tte*. For the latter two particles, it was speculated that children's cognitive development is linked to the relatively late acquisition period.

*Cantonese.* Lee and Law (2001) provide naturalistic data on the acquisition of Cantonese evidential particles in 3 children. Here we concentrate on their findings for 3 particles – *lo1* (direct evidence/certainty), *wo5* (hearsay/indirect evidence), and *gwaa3* (uncertainty/inference). Only 3 instances of *wo5*, and no instances of *gwaa3* were observed in the data. By contrast, more than 500 instances of *lo1* were found. Lee and Law speculate that the late emergence of *wo5* and *gwaa3* is due partly to cognitive (i.e. representational) and linguistic complexity (e.g. the fact that adults use these particles in several different contexts), and partly due to paucity of input. Indeed, it was reported that the 3 mothers used the hearsay particle *wo5* 14 times and the uncertainty particle *gwaa3* 5 times, whereas they used certainty particle *lo1* more than 1000 times.

*Korean.* Choi (1995) looks at 3 Korean children's acquisition of sentence-final suffixes. She suggests that the meanings of sentence-final suffixes are easier for children to grasp than, for example, the meanings of modal auxiliaries, as the former (a) are deeply situated in conversation; (b) occur in sentence-final position, which is perceptually more salient; and (c) constitute an obligatory category. Of particular interest here are the 2 evidential suffixes *-ta* (direct evidence/new information) and *-tay* (indirect evidence/hearsay). Of all the sentence-final suffixes, *-ta* was acquired first sometime before 2;0 and *-tay* was acquired somewhere between 2;0 and 2;6. An additional meaning of *-ta*, namely, 'unknown to the listener' was acquired after 2;6.

*Turkish.* Acquisition of the meanings of Turkish particles was investigated by Aksu-Koc (1988). Turkish particles are typically multifunctional: for example, the particle *-mis*, for which the most detailed description and analyses from a developmental perspective are provided, expresses past tense, perfect aspect and indirect experience (evidential mood). The particle *-mis* is contrasted with another past tense particle *-dı*, which also indicates direct evidence. With respect to these evidential particles, Aksu-Koc demonstrates that the different meaning components of each particle are acquired sequentially, by examining the data of 3 children between 1;9 and 2;6. The particle *-dı* (past/direct experience) emerges first, and is followed by the indirect experience marker *-mis* (past/perfect/indirect experience), around 2. Furthermore, Aksu-Koc reports that use of *-(ı)mis* to indicate hearsay did not occur in the sample, which suggests that understanding of this particular function of the particle develops later. Indeed in her later study, it was found that Turkish-speaking children start using the hearsay marker *-(ı)mis* productively between 2 and 3 years of age. In summary, naturalistic data indicate that Turkish-speaking children acquire the basic system of evidentiality by the age of 3 (Aksu-Koc et al., 2009).

*Quechua.* On the basis of naturalistic mother-child conversation, Courtney (2008) reports that Quechua-speaking children start producing the marker of direct evidence *-mi* around 2 years of age. The evidential marker *-mi* has multiple meanings such as affirmation, certainty and direct evidence. It was found that children first understand and use it as a marker of the speaker certainty between the age of 2 and 4. Around 4, children start using *-mi* productively to indicate direct observation as well as *-cha* to indicate information is based on inference. Only a few instances of the marker of indirect (hearsay) evidence *-si* were found in the conversational data of children between 4 and 8, which indicates that the marker is acquired gradually after around 4 years of age. It was also found that in the context of story-telling, the same evidential marker *-si* was productively used by 5-year-olds.

In summary, the naturalistic studies reviewed above indicate several important patterns in young children's production of certainty markers and evidentials. First, children are likely to produce certainty markers before they start using uncertainty markers. Second, children produce the marker of direct evidence before they use the marker of indirect evidence. Third, acquisition of the overall evidential system in a language takes time. Overall, the following 3 factors are suggested to determine the production timing of these markers: (1) frequency of input, (2) conceptual complexity and (3) functional multiplicity.

## 2.2 Experimental data

In this section, I focus on experimental studies that examined children's semantic understanding of epistemic and evidential markers. Studies that addressed pragmatic understanding of what these markers indicate (e.g. the information accompanied by the marker of direct evidence is likely to be taken to be more reliable than the information accompanied by the marker of indirect evidence) will be discussed in Section 3.

*Turkish.* Turkish-speaking children's understanding of the meaning of evidential particles was tested by Aksu-Koc (1988). In one of the comprehension tasks, children between 3;0 and 6;4 had to identify who the likely speaker was for each of several utterances. In the procedure, two candidate speakers were introduced to the children: one who had witnessed the event in question, and the other who had just come in and who could only comment on the existing situation by making an inference from an observable end-state. Half of the utterances were inflected with *-mis* (past/indirect experience), and the other half with *-dı* (past/direct experience). The results revealed that correct identification of the speaker for *-mis*-inflected utterances was below chance for children at 4;11, whereas *-dı*-inflected utterances were understood at above chance levels as early as 3;8. Aksu-Koc observes that one group of children (mean age 4;6) did not seem to pay attention to the linguistic distinction between *-dı* and *-mis* to identify the speaker. The overall results indicated that Turkish-speaking children's metalinguistic understanding of the function of the particle *-mis* comes in around 5;0, much later than when they start using it at around 2;0.

The lag between early emergence and successful comprehension of the two particles was also confirmed by production studies (Aksu-Koc, 1988). In one study, children between 3;0 and 6;4 were asked to describe an event from different perspectives, for example, from the perspective of direct experiencer which requires the use of *-dı* or from the perspective of indirect experiencer which requires the use of *-mis*. The results demonstrated that children between 3;0 and 3;7 were capable of using



*-di* accurately and appropriately. Successful use of *-mis* was achieved by children 6 months later, between 3;8 and 4;3. Aksu-Koc concludes that although both particles emerge in children's conversation by 3;0, appropriate use according to the context (e.g. witnessed vs. non-witnessed) develops gradually between the ages of 3;6 and 4;6.

*Korean.* A study by Papafragou and Li (2002) included an experiment to test Korean children's comprehension of the two evidential particles *-ta* (direct evidence/new information) and *-tay* (indirect evidence/hearsay). Three- and 4-year-old children listened to pairs of utterances (by 2 protagonists) about the contents of a box. The utterances were identical except for the type of inflection used: one was inflected by *-ta*, and the other by *-tay*. Children were then prompted to identify how the protagonists acquired the information by answering experimenter questions such as: 'Who did tell what's in the box? Goofy or Daisy?' and 'Who saw what's in the box? Goofy or Daisy?' Results showed that the performance of neither 3- nor 4-year-olds was above chance level. Here again, in light of Choi's observation that Korean children start producing both *-ta* and *-tay* at 2, the result of the experiment strongly suggests that their metalinguistic and conceptual awareness of the meaning of those particles comes later. A more recent comprehension study by Papafragou and her colleagues (2007) also confirms the lag between early production and later comprehension for the *-e* (direct evidence) and *-tay* (indirect evidence/hearsay).

*Tibetan.* De Villiers et al. (2009) reports the results of some intriguing experiments testing Tibetan-speaking children's understanding of syntactic and semantic properties of the evidential system. In a production study, children between 2 and 6 were asked to describe a variety of situations for which they had either direct or indirect evidence. They found that *'dug* (the direct (visual) evidence) was the most frequently used, but could not specify what children meant by the particle. Therefore, in one of the comprehension studies, *'dug* and other evidential markers with contrasting meaning, *yod red* (neutral), and *yod gi red/yod sa red* (inference based on indirect evidence) were chosen for stimuli to see if and when children are able to detect the semantic difference among them. Children were instructed to listen to utterances containing evidential markers and to tell whether the speaker had direct (visual) evidence or not for the information described. They found that among the 4 evidentials, *'dug* and *yod red* were understood earlier between 6 and 7 years of age whereas *yod gi red/yod sa red* were difficult to grasp even for 9-year-olds. The authors were cautious, however, about how to interpret the finding, as the evidential marker *'dug* is also frequently used to indicate speaker certainty, rather than direct visual evidence. Subsequent experiments were carried out to test which aspect of the meaning of *'dug* Tibetan-speaking children predominantly understand and use. It was revealed that the predominant meaning of *'dug* for these children was speaker certainty.

To summarize, the three studies reviewed here suggest that children comprehend the marker of direct evidence before the marker of indirect evidence. The same sequential pattern was also found in young children's production of these markers. However, children accomplish the semantic understanding of these two evidentials much later than when they first produce them. The lag between early production and relatively late comprehension of evidentials indicates that the development of relevant concepts in children is time-consuming. For example, children need to understand the concept of direct evidence well enough to compare and contrast with the concept of indirect evidence in order to pass the comprehension tests mentioned above. Such full understanding of the concept is rarely required to produce the same evidentials in daily conversation.

### 3. Language-cognition interface

#### 3.1 Information/speaker reliability

As we frequently gather new information through someone else's testimony, and yet not all the information is truthful, it is crucial for us to be capable of assessing the reliability of information. Past studies on children's assessment of information reliability revealed that preschool children can make use of a variety of clues for the assessment: for example, speaker certainty, past reliability, age, and source of knowledge (Harris, 2007). Here I review studies investigating children's assessment of information reliability on the basis of linguistic clues.

*English.* The experiments carried out by Moore and his colleagues are probably the best-known examples of how children's understanding of expressed speaker certainty can be tested. Moore, Bryant, and Furrow (1989) tested 3- to 8-year-old children using a task that required the children to find a hidden object. The object was hidden in one of two boxes, and children received verbal clues from two different puppets about where the object was hidden. The puppets' utterances, each containing a different degree of certainty marker, indicated a different box as the location of the hidden object. For example, in one condition, the descriptions of the location were prefixed by *I know* or by *I think* as in "I know it's in the red box" or "I think it's in the blue box." The results indicate that 4-year-olds are capable of differentiating the degree of speaker certainty associated with each of the two verbs, while 3-year-olds are not. Subsequent experiments carried out by Moore and his colleagues also included modal expressions such as *must* and *might* in one of the verbal clues, as in "It might be in the blue box" versus "It must be in the red box" (Moore, Pure, & Furrow, 1990). Children's understanding of modal expressions was found to correlate strongly with their understanding of mental verbs.

A study carried out by Sabbagh and Baldwin (2001) addresses the issue of understanding speaker certainty in the particular context of word learning. In one of their two studies, Sabbagh and Baldwin investigated whether young children learn words better from “knowledgeable” speakers than from “ignorant” ones, where the knowledgeable speaker explicitly tells the child he knows the referent of the word very well, and the ignorant speaker says that he does not. Both 3- and 4-year olds learned novel names for objects better when the speaker stated that he knew the referent well, than when the speaker said that he did not.

Hirst and Weil (1982) investigated children’s understanding of degree of certainty expressed by modal auxiliaries, using the hidden object paradigm. Children (ages 3;0–6;6) were told that a peanut was hidden in either one of two containers and that puppets will tell them where it is. Each one of the two puppets gave conflicting information to the child, marked with different modal expressions: for example, “The peanut must be under the box” vs. “The peanut may be under the cup”. It was found that children first understand the contrast between plain assertion (“The peanut is under the cup”) and the statement accompanied by *may* (uncertain) before grasping the contrast between *must* (almost certain) and plain assertion (certain).

Noveck, Ho, and Sera (1996) extended the study of Hirst and Weil in two ways. They tested 5-year-olds’ understanding of speaker certainty with a wider range of modal expressions: *is* vs. *has to*, *has to* vs. *might*, and *is* vs. *might*. They also examined children of a wider age range – between 5 and 9 years – and compared their performance with that of adults. The main findings of the two experiments were (a) that understanding of modal expressions gradually develops over time between 5 and 9 years of age, and (b) that 9-year-olds show adult-like understanding of modal expressions.

*Bulgarian.* Fitneva (2008) investigated Bulgarian children’s assessment of speaker reliability. In the first experiment, children were shown six vignettes in which one protagonist queried the whereabouts of his friend, and two protagonists answered the question. Crucially, the answers provided by the two protagonists contradicted each other. Children were asked to choose one of the protagonists as the one to be more likely to be trusted by the person who asked the question.

Four different evidentials were chosen to be part of the protagonists’ contradictory answers about the whereabouts of the friend. As the following examples show, each of them indicated a distinct source of knowledge: Direct evidence, direct inference, indirect (hearsay) evidence, indirect (hearsay) inference:

- (a) Ivan otid-e v park-a.  
 Ivan go-PAST 3SG in park-DEF  
 ‘Ivan went to the park; I saw that.’

- (b) Ivan e otish-al v park-a.  
Ivan is go-PAST PARTICIPLE MASC in park-DEF  
'Ivan went to the park; I've concluded this on the basis of other things I know.'
- (c) Ivan otish-al v park-a.  
Ivan go-PAST PARTICIPLE in park-DEF  
'Ivan went to the park; someone told me – she or someone else had seen Ivan do that.'
- (d) Ivan bi-l otish-al v park-a.  
Ivan be-PAST PARTICIPLE go-PAST PARTICIPLE in park-DEF  
'Ivan went to the park; someone told me – she or someone else thought that's what Ivan must have done.'

The result showed that 6-year-olds preferred information on the basis of inference than on the basis of either direct or indirect evidence. It was suggested that 6-year-olds did not understand the link between reliability of information and perceptual sources. Nine-year-olds, by contrast, weighed information based on evidence (either direct or indirect) more heavily than information based on inference. Neither group of children showed a strong preference for direct evidence over indirect evidence.

The second experiment revealed that children's preferences changed when the question was about what the friend did rather than where the friend was. Nine-year-olds preferred first-hand over second-hand information. Six-year-olds did not show any preference. It was concluded that the acquisition of evidentials is a protracted process, and only around 9 years of age do children demonstrate mature enough understanding to assess the reliability of information flexibly.

*Japanese.* Children's spontaneous understanding of linguistically-encoded speaker's knowledge states has been investigated by Matsui, Yamamoto, and McCagg (2006). Matsui et al. presented preschoolers (aged 3–6 years) with hidden object tasks that prompted them to make decisions based on two conflicting utterances, each of which was marked with an expression of a different degree of speaker certainty and evidentiality. The linguistic stimuli chosen to convey speaker certainty and evidentiality through both particles and verbs are shown in Table 1. As there is no particle to indicate that the information was obtained via visual observation in Japanese, the certainty particle *yo*, which pragmatically indicates that the speaker has compelling evidence (stronger than hearsay) to support his certainty, was selected to be contrasted with the hearsay particle *tte*.

They found that children comprehended certainty contrasts better than evidentiality contrasts, and that they understood speaker's knowledge states better when they were conveyed by particles than by verbs. It was found that 3-year-olds already had a fairly good understanding of the particles of speaker certainty *yo* and *kana*, but that their understanding of equivalent verbs remained poor. Matsui et al.

**Table 1.** Contrastive pairs used in hidden-object task (Matsui, Yamamoto, McCagg, 2006)

Linguistic form	Epistemic states	Contrastive pairs
Particles	Certainty	<i>yo</i> vs. <i>kana</i>
	Evidentiality	<i>yo</i> vs. <i>tte</i>
Verbs	Certainty	<i>shitteru</i> (know) vs. <i>omou</i> (think)
	Evidentiality	<i>mita</i> (saw) vs. <i>kiita</i> (heard that)

suggested that one possible reason for the earlier understanding of certainty particles than verbs is input frequency, which was confirmed by a frequency analysis of naturalistic mother-child conversation data (see Table 2).

Another intriguing finding was that children's understanding of epistemic particles did not correlate with the children's false belief understanding. In contrast, children's understanding of epistemic verbs did relate significantly to whether or not they pass false-belief tasks. The overall results thus seem to indicate that the understanding of speaker's knowledge states conveyed by epistemic particles may involve different mechanisms from those involved in understanding epistemic verbs.

**Table 2.** Frequency counts for certainty and evidentiality markers in the Tai corpus (Matsui, Yamamoto, & McCagg, 2006)

		Child	Mother
<b>Certainty</b>			
Verb	<i>shitteru</i> (know)	34	70
	<i>omou</i> (think)	12	51
Particle	<i>yo</i>	3317	3995
	<i>kana</i>	145	970
<b>Evidentiality</b>			
Verb	<i>miru</i> (see)	109	410
	<i>kiku</i> (hear)	6	34
Particle	<i>tte</i>	270	1603

Matsui and Miura (2009) extended the study by Matsui et al. (2006) by investigating whether children could give adequate justifications for their choice of which was the more reliable speaker out of the two. They found that 4-year-olds were unable to provide a good justification for their choice even when they made the right choice of speaker. Children between 5 and 7 years of age could make some adequate justifications by referring to the relevant utterance, but even the oldest children's performance was far from that of adults. A particularly interesting finding was that children were much better at making justifications when they heard utterances with epistemic and evidential particles than when they heard utterances with equivalent verbs.

### 3.2 Source monitoring and suggestibility

Developmental studies in the last 30 years have revealed that children's conceptual understanding of sources of knowledge develops gradually. The earliest understanding is about the connection between seeing and knowing demonstrated between 3 and 4 years of age (Pillow, 1989; Pratt & Bryant, 1990; Wimmer, Hogrefe, & Sodian, 1988). More systematic modality-specific knowledge acquisition – for example, type of sound by hearing, or degree of hardness by touching – is achieved around age 4 (O'Neill & Gopnik, 1991; Robinson, Mitchell, & Nye, 1995; Robinson & Whitcombe, 2003; Whitcombe & Robinson, 2000). Then, around 6 years of age, children begin to grasp that inference is also a legitimate source of knowledge, and around 9 years gradually come to distinguish a variety of inferences, for example, between deduction and mere guessing (Sodian & Wimmer, 1987; Pillow, Hill, Boyce, & Stein, 2000).

The question of if and how language influences children's conceptual understanding of knowledge source has been addressed recently. It is hypothesized that children who grow up with a rich system of evidentiality in their native language should have an advantage towards an earlier and more robust understanding of the concept of knowledge source. Below, I briefly review some of the studies testing this hypothesis.

*Korean.* Papafragou et al. (2007) compared non-linguistic source monitoring ability (e.g. understanding of mode of knowledge acquisition such as seeing and touching) of Korean and English preschool children (ages 3–4). It was predicted that Korean children would show superior performance if the use and understanding of Korean evidentials promote conceptual understanding of knowledge source. They found no difference between the performance of Korean children and that of English children in the non-linguistic source monitoring task. Neither did they find a correlation between Korean children's comprehension of evidentials and their performance on a non-verbal source monitoring task. The authors concluded that Korean evidentials did not bootstrap Korean-speaking children's conceptual understanding of source knowledge. Interestingly, though, there was a significant positive correlation between Korean children's correct use of the hearsay marker *-tay* and their performance on a non-linguistic source monitoring task. This finding suggests that there is some connection between understanding of evidentiality and source monitoring.

*Turkish.* A study reported in Aksu-Koc et al. (2009) investigates the connection between use of evidentials and source monitoring. They hypothesized that Turkish-speaking children's ability to understand the linguistic indication of knowledge source would boost their non-linguistic source monitoring ability. More specifically, they predicted that children's ability to use evidentials would

predict their ability to understand and identify the source of knowledge held in memory. To examine their ability to use evidentials, children were asked to describe, comment on, or retell some events with appropriate evidentials. Each of the events presented required them to choose either *-dı* (direct visual evidence) to describe, *-mis* (inference) to comment on, or *-(ı)mis* (indirect hearsay evidence) to retell. Children were also tested in a source-memory task adopted from Drummey and Newcombe (2002). They were asked to identify the person from whom they acquired information through linguistic report a week later. It was found that children's ability to use *-(ı)mis* (indirect hearsay evidence) predicted the ability to remember the source of information. In addition, comparison between Turkish-speaking 4-year-olds' correct source identification performance and English-speaking 4-year-olds' performance in an equivalent task (Drummey & Newcombe, 2002) revealed better performance in Turkish-speaking children. They concluded that speaking a language with evidentials boosts development of memory of the knowledge source.

This finding is particularly interesting when compared to the result of a separate source reporting task (based on Gopnik and Graf, 1988) carried out by the same authors. In this task, children were asked to verbally identify the content of boxes either by looking into the box, by guessing, or by being told about it, and then to report immediately how they found out about it. Unlike the source memory task, children's performance in the source reporting task had no significant relationship with children's ability to use evidentials. Overall, it was suggested that linguistic representations of evidentials have a positive influence on long-term source memory but not on an immediate awareness of knowledge source.

If children who acquire a language with evidentials have superior long-term source memory, as Aksu-Koc et al. have argued, it is also reasonable to hypothesize that they may develop a stronger resistance to the misleading suggestions of others. This question has been addressed by Aydin and Ceci (2009). It is well-known that when there is a mismatch between their memory of an event and others' testimony, young children tend to alter their statement to match the others' suggestion (Ceci & Bruck, 1993). In other words, young children are typically highly suggestible. Aydin and Ceci suggest that evidential language provides grammatical tags to differentiate between original (direct evidence marker) and post-event information (indirect evidence marker). They further argue that those grammatical tags will make children's source memory robust enough to be less susceptible to misinformation. Their hypothesis was tested in an experiment where Turkish-speaking children were presented with a pair of videotaped stories, each of which was narrated by a different adult. Stories were paired to be about the same event but from different perspectives. For example, if a child heard the unfolding events from a direct witness perspective (with the direct evidence

marker *-di*) first, then he heard it from a hearsay perspective later (with the indirect evidence marker *-(t)mis*). Children were shown misleading details either in the story from the direct witness perspective or in the story from the hearsay perspective. The findings were intriguing. Four-year-old Turkish-speaking children who heard the original story from the direct witness perspective were rightly resistant to misleading information shown in the story from the hearsay perspective. However, when the original story was narrated from the hearsay perspective, they were equally suggestible to direct witness or hearsay misinformation. Five-year-olds trusted the story from the direct witness perspective more than the hearsay alternative regardless of the original perspective. Furthermore, in the control condition where both stories were presented from the same perspective, 5-year-olds were more resistant to misinformation than 4-year-olds. Aydin and Ceci concluded that Turkish-speaking preschool children's sensitivity to the reliability of information source makes them less susceptible to misleading information presented in the story from the hearsay perspective.

#### 4. Suggestions for future research

##### 4.1 We need denser and longer longitudinal data

The studies reviewed in this chapter strongly suggest that the full system of epistemic modals and evidentials is acquired rather late, in the early to middle school years. Such protracted development may occur for two reasons. First, those markers are often semantically multifunctional (for example, both Tibetan *ʼdug* and Quechua *-mi* mean speaker certainty as well as direct visible evidence). Second, understanding such multifunctionality and being able to tease apart each function when necessary requires rather sophisticated representational and processing capacities which develop gradually in the early to middle school years (Karmiloff-Smith, 1979).

It is clear that we simply need more studies on the acquisition of grammaticalized epistemic and evidential markers. In particular, as we have begun to see that children's use of evidentials predicts more robust conceptual reasoning of speaker knowledge, it is urgent to collect more data on children's production of grammaticalized epistemic and evidential markers. The majority of existing naturalistic studies have a crucial limit of having data from only very young children, typically between one and three years of age. Provided that adult-like understanding of epistemic and evidential markers is not achieved before the age of 9 or 10, naturalistic or elicited data of older children's production of those markers is urgently needed.



In order to examine subtle developmental differences in a given child's use of epistemic and evidential markers over time, detailed analyses of dense data are essential. In our lab, we have analyzed and compared a child's use of the Japanese hearsay particle *tte* over the period between 2;0 and 3;0 (Matsui & Yamamoto, 2011, 2013). The study is based on the Max Planck-Matsui database and focused on the two time points – 6 weeks after the child's second and third birthdays – during which the data was collected intensively, 5 days a week. We found that the child was using *tte* accurately at 2 years, as predicted by previous studies. We also found several differences in the child's use of *tte* at the 2 time points. For example, the child's use of *tte* to quote utterances was restricted to pretend play at 2, similar to results from Korean-speaking children as reported in Choi (1995). However, after her third birthday the child started using *tte* increasingly to quote real-life utterances. The mother's use of *tte* did not vary at the 2 time points, so the input does not appear to have a causal effect on the difference in the child's use of the particle at the two time points. We expect that the child's use of the particle will change further as she grows older, and have started to analyze the data collected when the child was 4 and 5. Currently longitudinal data from older preschool children is rare, and even more so longitudinal data from school-aged children. In order to investigate the development of epistemic and evidential markers, however, longitudinal data over longer time periods to include children beyond age 3 is highly desirable, although it is clearly quite hard to keep the same participants for many years of data collection.

#### 4.2 Older children are also needed for experiments

A brief review of existing experimental studies above on the connection between acquisition of grammaticalized epistemic and evidential markers and assessment of information reliability and source of knowledge revealed 2 general trends. First, the understanding of grammaticalized markers of speaker knowledge does not appear to promote preschoolers' non-linguistic conceptual understanding of speaker knowledge beyond its own universal course of development (Papafraou et al., 2007). Second, accurate use of those markers (the hearsay marker, in particular) does, however, appear to boost children's ability to store information about speaker knowledge in their mind and to reason about it (Aksu-Koc et al., 2009; Ceci & Aydin, 2009).

Discovery of the second trend is important for many reasons, but here let me focus on a single point: for future research on the interface between language and cognition, we need to look at school-aged children rather than young preschoolers. Studies on Turkish-speaking children indicate that only specific evidential

markers such as the marker of hearsay evidence, which are acquired late compared with some other evidentials such as the marker of direct evidence, seem to boost children's source monitoring. This in turn suggests that the main improvement in source monitoring in Turkish-speaking children may only be demonstrated later in development, not during early preschool years. In this sense, it is quite striking to see that Turkish-speaking children demonstrated better source memory than English-speaking children at 4 years of age.

The importance of looking at older children to examine the interface between language and cognition regarding evidentiality is clearly demonstrated in one of the experiments reported in de Villiers et al. (2009). They tested Tibetan-speaking children's ability to infer the speaker's knowledge with the task called "the shadow-child task". Children between 6 and 10 years of age were shown several colored pictures in which a boy with a hat is supposed to be looking at another boy with a hat but only the shadow of the second boy is visible in the picture.



**Figure 1.** Sample picture used in the Shadowchild Task (de Villiers et al., 2009)

Children were encouraged to take the perspective of the shadow boy and infer the color of the hat the shadow boy is wearing in each picture. Three types of clue for them to infer the color of the hat were given. The color of the first boy who was fully visible was an obvious clue. The second clue was what the visible boy said: for example, he may say that his hat was red. Notice here that the visible boy cannot see the color of his own hat and has to infer it on the basis of the color of the hat on the shadow-child. The third clue was the pictorial message from a hatter who always gives two boys three hats each of which is either red or white. The number of red and white hats varies in each picture and the pictorial message tells the child how many red hats and how many white hats were given to boys in each picture.

Children were expected to reason about what evidence the visible boy used in order to conclude about the color of his own hat. If the hatter had two red hats and one white hat and the visible boy says “I know the color of my hat to be red”, for example, children were expected to infer (a) that the shadow-boy’s hat was a color that allowed him to know for sure that his own hat was red; (b) if the visible boy had seen a red hat, then another red hat and white hat would have remained and in that case he would not be able to know for sure the color of his own hat; (c) since the visible boy knows the color for sure, then he must have been able to see that shadow-boy’s hat is white.

De Villiers and colleagues found that Tibetan-children’s performance in this complicated task was surprisingly high: They were correct 80 percent of the time (73 percent for younger group of children and 85 percent for the older group). They clearly outperformed a control group of English-speaking children who were correct 34 percent of the time. In addition, Tibetan-speaking children’s performance was correlated well with their accurate use of *yod sa red* (inference) in questions, which indicates a strong connection between their reasoning ability in the shadow-child task and their accurate use of evidentials. Clearly the choice of school-aged children as participants was a crucial factor to discover these interesting findings. Many more studies with school-aged participants are needed to understand further the interface between cognitive development and acquisition of epistemic and evidential markers.

## 5. Final remarks

It is too early to draw any definite conclusions about the relationship between language and cognitive development concerning linguistic expressions of certainty and evidentiality. But what we have learned from the studies reviewed here is that reasoning about the speaker’s knowledge is a quite complicated endeavor that requires maturity in both the linguistic and the conceptual domains in our cognition. This

span of learning covers much of the first decade of a child's life. It also opens the question of exactly when we consider the process of language acquisition to be substantially complete, as this may be later than previously thought and continue into adolescence and even adulthood (Berman, 2004). Elucidating this process will be one key to understanding social and cognitive development of children.

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