# Cognitive Critique

# CHILDREN'S USE OF REFERRING EXPRESSIONS: WHAT CAN IT TELL US ABOUT THEORY OF MIND?[1]

## Jeanette K. Gundel

*Linguistics Program*
*University of Minnesota, Minneapolis, MN*

*E-MAIL*: gunde003@umn.edu

**ABSTRACT**

This paper presents results of investigations of children's use of referring expressions in spontaneous conversation with adults, and considers possible implications of this work for questions relating to development of a theory of mind. The study further confirms previous findings that children use the full range of referring forms (definite and indefinite articles, demonstrative determiners, and demonstrative and personal pronouns) appropriately by age 3 or earlier. It also provides support for two distinct stages in mind-reading ability. The first, which is implicit, includes the ability to assess non-propositional cognitive states such as familiarity and focus of attention in relation to the intended referent; the second, which is representational and more conscious, includes the ability to assess epistemic states such as knowledge and belief. Distinguishing these two stages supports attempts to reconcile seemingly inconsistent results concerning the age at which children develop a theory of mind. It also makes it possible to explain why children learn to use

referring forms in ways consistent with the cognitive statuses they encode before they exhibit the pragmatic ability to consider and calculate quantity implicatures, which require assessment of how much information is relevant for the addressee.

# INTRODUCTION

It is a characteristic, and probably unique, feature of human language that the same entity can be referred to in many different ways, using different forms such as *it, that, the restaurant, a restaurant, that great restaurant we went to in Berlin,* and so on. Unlike some other characteristic features of human language, syntactic properties such as recursion, for example, this feature appears to be necessarily rooted in the interactive function of language, i.e. in its use for the purpose of communication between two intentional agents.

While accounts of nominal reference and use of referring expressions differ, it is now generally agreed that the particular forms a speaker/writer uses are at least partly constrained by her assessment of the addressee's memory and attention state at the point in the discourse when the form is used. Gundel, Hedberg, and Zacharski (1988, 1989, 1993, and subsequent work) take this observation one step further by proposing that individual lexical items, specifically determiners, such as *the*, and pronouns, such as *it*, encode, as part of their conventional meaning, information about the cognitive (memory and attention) status of the speaker's intended referent in the mind of the addressee when the nominal form is encountered. If this account is correct, children's acquisition of such form should shed light on the development of their sensitivity to the mental states of others, in particular when these are different from their own – what has sometimes been called 'theory of mind' (e.g. Premack and Woodruff 1978, Baron-Cohen 1995.) The present paper reports on an ongoing study that aims to investigate the connection between theory of mind, in this broad sense, and children's use of referring expression. After an outline of the Givenness Hierarchy framework and some of its assumptions and predictions, the paper reports on studies of children's use of referring expressions in spontaneous discourse, concluding with some preliminary implications of this work for issues related to the development of a theory of mind.

# THE GIVENNESS HIERARCHY

Gundel, Hedberg and Zacharski 1993 propose that determiners and pronouns in natural language conventionally encode information about the cognitive (memory and attention) status of the speaker's intended interpretation of a nominal phrase (e.g. *it, that, the restaurant*) for the addressee at the point just before the phrase is encountered. The relevant statuses are listed below, along with the form that is hypothesized to conventionally encode that status in English.

Givenness Hierarchy (GH) (Gundel, Hedberg, and Zacharski 1993)[2]

| in focus > | activated > | familiar > | uniquely identifiable > | referential > | type identifiable |
|---|---|---|---|---|---|
| *it* | *this, that, this N, SHE* | *that N* | *the N* | *indefinite this N* | *a N* |

Forms on the GH encode procedural information (i.e. instructions to the addressee) about the manner of accessibility[3] of the referent, as described in (1).

(1)

    in focus:                   associate representation in focus of attention
    activated:                 associate representation in working memory
    familiar:                     associate representation in memory
    uniquely identifiable: associate unique representation with phrase
    referential:               associate unique representation
    type identifiable:      associate type representation

For example, in the English sentence *That dog next door kept me awake*, the determiner *that* encodes the information that the addressee is expected to already have a representation of the dog in memory (familiar), and so can uniquely identify it (uniquely identifiable); in *The dog next door kept me awake*, the definite article *the* only encodes the information that the addressee is expected to associate a unique representation by the time he has finished processing the phrase *the dog next door*, however he can do that (by retrieving a representation from memory or by constructing a new one.)

Statuses on the GH are in a unidirectional entailment relation

(represented here by >). Anything in focus is necessarily activated, anything activated is necessarily familiar, and so on. Thus, forms that explicitly encode particular statuses are underspecified for higher statuses rather than excluding them. This results in a one-to-many mapping between statuses and the forms that explicitly encode them, as illustrated in (2).

(2)
|   |   |
|---|---|
| A | So you've only known the dog how long did you say? |
| B | Well, about a year, I guess. |
| A | Oh well. Is it, uh, how old is the dog? (Switchboard Corpus) |

In (2), A and B have been talking about B's dog, who should clearly be in focus for B in A's second utterance, as it has been the topic of conversation and part of the interpretation of every utterance up to this point. Speaker A used a full determiner phrase with a definite article to refer to the dog, but a pronoun (e.g. How old is *it*) or a full determiner phrase with a demonstrative determiner (How old is *this dog*?) would have been equally appropriate in this context, since the status 'in focus' entails all other statuses. Forms are not randomly distributed across referents that meet the minimal cognitive status, however. Unidirectional entailment of statuses on the GH gives rise to pragmatic inferences, specifically scalar implicatures (Horn 1972), resulting from the first part of the Maxim of Quantity (make your contribution as informative as required, Grice 1975). Just as *some* typically gives rise to the implicature *not all* (even though it is perfectly consistent with *all*, since *all* entails *some*), the indefinite article is rarely used for statuses higher than referential, and its use is typically associated with an implicature that the addressee is unable to uniquely identify the referent (and it is also therefore not familiar, activated, or in focus.). Thus, *a dog* in (3) would normally be interpreted as introducing a new entity who is not uniquely identifiable, and therefore also not already familiar to the addressee.

(3)
   My neighbor has a dog.

   Similarly, demonstrative pronouns, which encode the status 'ac-

tivated', often give rise to an implicature that the referent is at most activated, i.e. not in focus. For example, *that* in (4) is interpreted as referring to *the closet*, not *the kitchen*, which is in focus as has been mentioned twice and is the focal point of the description.

(4)

　　Anyway, going back from the kitchen then is a little hallway leading to a window. Across from the kitchen is a big walk-through closet. And next to *that* is …. (from Gundel et al. 1993)

　　Within the GH framework, then, the non-familiarity interpretation associated with the indefinite article and the focus shift interpretation associated with demonstrative pronouns are treated as implicatures, rather than conventional meanings of these forms. This account is supported by data like those in (5)-(8). As (5) shows, the non-familiarity implicature associated with the indefinite article can be cancelled without contradiction.

(5)

　　My neighbor has *a dog*. *It*'s the one you saw him with yesterday.

　　Also, implicatures do not arise when the information that would be conveyed by the stronger (entailing) form is irrelevant, as in (6)-(8).

(6)

　　I'm not going along; I've been sitting in a car all day. (adapted from Grice 1975)

(7)

　　Look. A man is hitting a dog.

(8)

　　I love John's kitchen. It's/That's my favorite room.

　　In (6), as Grice also points out, *a car* does not necessarily refer to a car that the addressee is unfamiliar with; it could in fact be a car jointly owned by the speaker and addressee, and even recently mentioned. Since it is the property of being a car and not the identity of the particular car that is relevant, use of *a* does not give rise to an implicature that the car is unfamiliar and not uniquely identifiable. Similarly, in (7), it is the event of a man hitting a dog and not the identity of the particular man or dog that is relevant; thus, neither

a man nor a dog give rise to the implicature that the referent is not uniquely identifiable, familiar, or activated. In fact, since uttering look, which would normally be accompanied by a gesture (e.g. eye gaze or pointing) would be sufficient to evoke a representation of the man and the dog in the mind of the addressee, both would be activated by the time the phrases *a man* and *a dog* are encountered.[4]

In (8), since there is only one activated entity, it is irrelevant for the purpose of identification to explicitly encode the fact that this entity is in focus; use of *that* therefore is not associated with an implicature that the referent is not in focus, and either *that* or *it* can be used to refer to the kitchen.

In some cases, the second part of Grice's Quantity Maxim (don't make your contribution more informative than required) blocks the implicature that the cognitive status encoded by a stronger form is not met. This explains why the definite article does not give rise to an implicature of non-familiarity (see Gundel, Hedberg and Zacharski 1993; Gundel and Mulkern 1998). Signaling (by use of the definite article) that the addressee can uniquely identify the referent is usually sufficient to allow interpretation of a definite description, given the encoded descriptive content and relevance-driven pragmatic inferences that favor the first interpretation that yields adequate contextual effects without undue processing effort (Matsui 1992; Sperber and Wilson 1986, 1995; Wilson 1992.) The definite article thus typically provides sufficient information about cognitive status, and an explicit signal of familiarity, such as a demonstrative determiner, is usually unnecessary.

# THE ACQUISITION AND USE OF REFERRING FORMS BY CHILDREN

## WHAT CHILDREN NEED TO 'KNOW'

Given the framework outlined above, the ability to correctly produce and understand referring expressions involves at least the following kinds of knowledge and abilities.

*Linguistic* − knowing which linguistic forms encode which cognitive statuses, e.g. determiner *that* means 'familiar'.

Such knowledge must be acquired, just as the meanings of other lex-

ical items (e.g. knowing that *dog* means 'dog') must be acquired.

*Non-Linguistic* (a) − ability to assess whether a referent has a particular status, e.g. whether it is already familiar to the addressee or not.

This ability is analogous to being able to assess whether something is a dog or not, i.e. understanding the concept 'dog' and recognizing one when you see one. As with concepts in general, it is unclear if there are innate predispositions which constrain whether and how these concepts are learned. In any case, the ability to assess whether or not a referent has a particular cognitive status for the addressee requires a 'theory of mind' in the sense that it involves a speaker's assessment of the addressee's mental state,

*Non-Linguistic* (b) − ability to assess when information about cognitive status is relevant , since this determines whether or not the strongest possible indicator of cognitive status will be used and when use of a weaker indicator will give rise to a scalar implicature.

Similar abilities are required to assess how much descriptive information is relevant, for example when one should say *the black dog* as opposed to simply *the dog*. Like the ability to determine what cognitive status the intended referent has for the addressee, the ability to assess when and how much information about cognitive status is relevant assumes a theory of mind.

## CHILDREN'S USE OF REFERRING EXPRESSIONS.

Naturalistic studies of spontaneous conversational discourse between children and adults find that children use the full range of referring forms (definite and indefinite articles, demonstratives, personal pronouns) appropriately by age 3 or earlier (e.g. Bennet-Kastor 1981; Bittner 2002, 2008; Gundel and Page 1998; Gundel, Sera and Page 1999; Gundel, Sera, Page, and Kowalsky 2000; Gundel and Johnson 2008; Hernandez-Pina 1994; Ntelitheos and Manorohanta 2004, inter alia). These findings are consistent with results of recent experimental work (e.g. Matthews et al. 2006; O'Neill 1996, 2005; Wittek and Tomasello 2005). However, they are at variance with some earlier experimental studies (e.g. Emslie and Stevensen 1981) as well as studies of children's narratives, which

suggest that children don't master use of the full range of referring forms (pronouns, demonstratives, definite vs. indefinite article) until age 7 or even later (see Hickman 2003 for an extensive review of the literature.)

The differences in findings may be due to methodology, as well as related factors, such as differences between spontaneous interactive discourse and elicited narratives. However, one also cannot conclude on the basis of use in spontaneous dialogue alone that children have mastered linguistic and pragmatic conditions for using referring forms in all contexts. As discussion settings tend to be restricted to objects and individuals in the immediate environment, appropriate use of referring forms may be simply a function of the restricted contexts in which the forms are used in the data (Karmiloff-Smith 1981; Hickman 2003). With this consideration in mind, Gundel, Ntelitheos, and Kowalsky 2007 and Gundel and Johnson 2008 analyzed children's use of referring expressions within the Givenness Hierarchy framework, asking not only whether or not a form was used and whether its use seems appropriate, but what cognitive status the interpretation of the form has, whether the full range of statuses that a form could be used for was represented in the data (for example, in adult use, the English definite article, *the*, is used for at most uniquely identifiable and all higher statuses, including in focus), and whether there were any forms that would not have been appropriate in the given context, i.e. could the child have made an error by using a different form. Both studies found that in spontaneous interactive discourse children use referring forms with a range of appropriate cognitive statuses, and rarely use determiners and pronouns in a way that violates the cognitive status restrictions on the form in question.

*Pronouns: Activated vs. In focus*
As noted in Gundel and Page 1998 and Gundel, Sera, Kowalsky, and Page 2000, the order of acquisition of forms that encode cognitive statuses seems to parallel the order of these forms on the Givenness Hierarchy, with pronouns, both demonstrative and personal, acquired first, and the indefinite article last. Thus, the data in the earliest transcripts examined for each child contains few if any articles or demonstrative determiners, but it does contain personal and demonstrative pronouns. Personal pronouns are used almost exclusively for in focus referents, and the demonstrative pronouns are used for both in focus and at most activated referents, but mainly for the latter. The example in (9) is from one of the earliest transcripts

from Eve in the Brown 1973 corpus, which contains only personal pronouns.[5]

(9) Eve 1:6 (Brown 1973) (MOT = Mother)

| | |
|---|---|
| MOT | put the other one back |
| MOT | those break |
| MOT | put the two back |
| MOT | thank you |
| EVE | it break |
| EVE | oh it break |
| MOT | and those break too |

Two things are noteworthy here. First, the form *it* used by Eve is not simply a repetition of a form used by her mother; second, the referent of *it* is clearly in focus for the mother at the point when Eve uses the form.

The example in (10), also from Eve but five months later, contains both demonstrative and personal pronouns. In line 55, Eve uses a demonstrative pronoun to refer to her father's shoes, which are in the immediate environment and therefore activated, but are not yet in focus at this point as they have not been previously mentioned. Since there is no reason to believe her father's attention has been focused on the shoes, use of *it* or *they* to refer to the shoes would have been inappropriate here, as unstressed personal pronouns, unlike demonstrative pronouns, require the referent to be not only activated, but in the addressee's focus of attention. In line 64, Eve uses the pronoun *it* to refer to one of the shoes, which at this point is clearly in focus as it has been mentioned (or is otherwise part of the interpretation) of each of her father's previous three utterances.

(10) Eve 1:11.8 (Brown 1973)

| | | |
|---|---|---|
| 55 EVE | that Papa shoes |
| 56 EVE | Papa's |
| 57 EVE | there |
| 58 | (*untied father's shoe*) |
| 59 FAT | what did you do? |
| 60 FAT | well#you tie that right up |
| 61 EVE | ok |
| 62 FAT | right now |
| 63 FAT | tie that shoe |
| 64 EVE | Papa tie it |

Later in the same transcript, Eve first uses a demonstrative pronoun for a referent that is probably already in focus for her mother and then later uses a personal pronoun for the same referent. Although she could have used a personal pronoun in line 363, the demonstrative is not inappropriate here, since anything in focus is also activated, and an adult might have used a demonstrative as well. What is especially noteworthy is that Eve uses the weaker form before using the stronger one, not the other way around. It would have been less appropriate (and less adult-like) to use a form that clearly assumes the referent is in focus and then follow it up with a weaker form that only signals activation (i.e. 'it are hot' … 'I better blow that'), and Eve does not do that.

(11) Eve 1:11.8 (Brown 1973)
| | | |
|---|---|---|
| 362 MOT | there # that one's just right |
| 363 EVE | that are hot |
| 364 MOT | well # it's not very hot |
| 366 EVE | I better blow it |

(12) provides two examples of personal pronoun use from one of the earliest transcripts examined from the Valian 1991 corpus (Gundel and Johnson 2007).

(12)  02a 1:9.21
| | |
|---|---|
| MOTHER | no, that hook doesn't hold it. |
| CHILD | yeah, it hold it. |
| | |
| MOTHER | what does the horse do in the truck? |
| CHILD | yeah, that's just, he eating |

In both examples, an entity which the mother introduces as a full noun phrase in subject position, and which is therefore clearly in focus, is referred to with a personal pronoun by the child.

The example in (13) is from a 43-page transcript from Adam (Brown corpus) at age 2;5, which contains 24 pronouns (all used appropriately), one demonstrative determiner, and no definite or indefinite articles.

(13) Adam 2:5.12
| | |
|---|---|
| ADAM | open dat |
| ADAM | open # mommy |
| ADAM | sarbaby?? |

|     |          |
|-----|----------|
| MOT | sardines |
| ADAM | sardines |

The demonstrative pronoun *dat* refers to the can of sardines that Adam wants his mother to open. Since the sardines have not been previously mentioned, and there is no other reason to assume the mother's attention is already focused on the sardines, the demonstrative is the strongest form that could have been used here, and a personal pronoun (open it) would have been inappropriate.

The examples in (14) are from Peter (Bloom 1970 corpus), at about the same age. The first example shows a personal pronoun *them*, used for a referent that is clearly in focus, since it has been introduced by Lois in a syntactically prominent, topicalized, position in the previous utterance. The second example is an especially sophisticated use of demonstrative pronouns, *this* and *that*, for referents that are at most activated and ones that are in focus.

(14) Peter 2:5.23

    362 LOIS     all the furniture # the tables and the lights and the beds # you can put in the house

    363 PETER   gonna. I'm gonna put them in the house

    *(Peter has long wall in arms in 'guitar' position)*

    4172 PETER  This is a guitar

    *(act holding another wall)*

    4173 PETER  awoh

    4175 LOIS    what's this?

    4176 LOIS    is that a guitar?

    4177 PETER  hm

    4179 LOIS    is that a guitar too?

    4180 PETER  yeah

    4181 PETER  two three guitars # here one # you

    *(Peter gives one of the 'guitars' to Patsy)*

    4183 PATSY  oh thank you

    4184 PETER  that's a guitar

    *(stops playing, looks at Lois' big wall guitar, pointing to wall Lois is holding, then to smaller one he has)*

    4245 PETER  No. that's my guitar and this is your guitar

As noted in Gundel and Johnson 2008, children in these transcripts rarely use personal pronouns when the referent is not in focus, and

they rarely use demonstrative pronouns when the referent is not at least activated. Moreover, in the few cases where the intended referent does not have the required cognitive status for the adult, the child is able to correct to a more appropriate form after feedback, as in example (15) from the Valian 1991 corpus.

(15) 21b 2:6.12 (barn mentioned 4 utterances back, and therefore no longer in focus, or possibly even activated, for the mother)

| | |
|---|---|
| CHILD | I'm going to clean it with my popper |
| MOTHER | you're going to what? |
| CHILD | clean the barn with my popper |

## Demonstrative determiners

As with pronouns, instances of demonstrative determiner usage in the data examined were almost always consistent with the minimum cognitive status required of the form in question, familiar for the distal demonstrative determiner *that/those* and activated for the proximal determiner *this/these*. However, demonstrative determiners are used more frequently by young children than either definite or indefinite articles. This is in contrast to adult usage, where demonstrative determiners are relatively infrequent compared to articles, or bare nominals (i.e. noun phrases without a determiner) in languages that lack articles. (Ariel 1988, 1990; Gundel, Hedberg, and Zacharski 1993; inter alia). Moreover, while demonstratives are more frequent in adult speech to children than in adult speech in general, frequency in the input cannot completely account for the high frequency of demonstratives relative to articles in children's speech, as frequency of demonstrative determiners in the adult input is still lower than that of definite or indefinite articles (Gundel and Page 1998). Gundel et al. 1993 attribute the relatively low frequency of demonstrative usage across languages to interaction of the Givenness Hierarchy with Grice's Maxim of Quantity (see above). Demonstrative pronouns (e.g. *this is good*) are not commonly used for in focus referents, and often give rise to the implicature 'not in focus', since they only require activation and thus provide less information about cognitive status than personal pronouns such as *it*. Demonstrative determiners (e.g. *this apple is good*) are typically used only when an explicit signal of activation or familiarity is crucial. As noted above, for full noun phrases, signaling (by use of the definite article) that the addressee is able to uniquely identify the referent usually provides sufficient information about cognitive status to allow the addressee to assign the intended interpretation,

given the descriptive content encoded in the noun phrase, and an explicit indicator of familiarity is thus often unnecessary. Gundel and Page 1998 note that the relatively high frequency of demonstratives in child speech compared to adult speech suggests that children acquire the linguistic knowledge about appropriate use of different pronouns and determiners, i.e. the cognitive status meanings conventionally encoded by these forms, before they make referential choices driven by the Quantity Maxim. This is consistent with other findings that sensitivity to pragmatic principles and resulting implicatures develops relatively late in children (e.g. Noveck 2001; Papafragou and Musolino 2003; Verbuk 2007) It may also explain some apparently anomalous findings related to use of the indefinite article (e.g. Maratsos 1974, 1976). The examples in (16)-(18) exemplify children's 'overuse' of demonstrative determiners.[6]

(16) Adam 2:5.12 (Brown 1973)
    ADAM       what dat?
    URSULA    that's a paper clip
    ADAM       what dat paper clip doing

(17) PETER 2:5.23 (Bloom 1970
    PETER     having trouble. I found another light
    *( pulling out another lamp)*
    LOIS       mm# yes you did
    PETER     turn this light

In both (16) and (17), the referent of the demonstrative determiner phrase (*dat paper clip*, *this light*) is in focus for the addressee when the phrase in question occurs. Use of the demonstrative is therefore licit, as anything in focus is also familiar and activated. However, an adult may have been more likely to use the strongest possible form 'it' or a weaker form in the case of the full determiner phrase ('the paper clip', 'the light').

    In (18), each of the individual uses of the demonstrative determiner or pronoun is licit, as the referent is at least activated; but the sequence of eight utterances, six of which contain a demonstrative, is not adult-like.

(18) Adam 2:6.3 (Brown 1973)
    MOT       no # don't write in your book
    ADA       look at dat
    ADA       look at dat pencil

| ADA | look at dat |
|-----|-------------|
| ADA | go in there dis way |
| ADA | what dat noise for |
| ADA | where go? |
| ADA | other side |
| ADA | came from dis side |

Example (19) is a more adult-like use of a demonstrative.

(19) PETER 2:5.23 (Bloom 1970)
 *(looking in bag for another slide)*
 423 PETER     where's that slide?

A pronoun (where's *that*, where is *it*) would not have been appropriate here, as the referent is not activated for the addressee; it hasn't been recently mentioned and is also not visible. A definite article would probably have been too weak. Although the slide Peter is looking for is likely to be familiar to the addressee, the phrase *the slide* does not contain sufficient descriptive content to allow the addressee to uniquely identify it. Use of a demonstrative determiner provides explicit information that this is a familiar slide that Peter is looking for. (20), from a later transcript, provides a similar example.

(20) Peter 2:8.12
 *( putting car down)*
 PETER          now I'm gonna get those tools
 *( walks back to bag, then begins picking up tools)*

### Definite article

The definite article begins to appear around the middle of the third year, and somewhat earlier for Eve, although it is not used consistently at first (i.e. it is often omitted), and not as frequently as the demonstrative determiners. All but one or two uses that we found in the data are appropriate. Though the full range of licit uses are found, from at most uniquely identifiable to in focus, most are for referents that are at least activated, as the children in these transcripts rarely talk about referents that have lower statuses. (21) illustrates an example of an early use of the definite article by Eve.

(21) Eve 1:11.8 (Brown 1973)
 *( looking at photographs)*

| FAT | Eve # please |
|-----|--------------|
| EVE | no # let me hold it |
| EVE | Eve in the snow |

The snow is clearly activated here, as it is visible in the picture; but there is no reason to believe that it is in her father's focus of attention, and a personal pronoun 'Eve in it' would therefore have been inappropriate. Note that Eve does use *it* in the previous utterance to refer to the photograph itself, which is clearly in her father's focus of attention, given the utterance that she is responding to. Even a demonstrative 'Eve in that' would have been infelicitous here. Although the snow is activated, there are a number of other things that are activated as well, and a pronoun would therefore not have been sufficient to distinguish among them. Two similar examples are provided in (22) and (23), from the same transcript.

(22)

| 384 MOT | yeah # it's alright to eat |
|---------|----------------------------|
| 385 EVE | yeah # it's alright to eat |
| 387 EVE | I got peanut butter on the paddle |

(23)

| 493 EVE | bowl |
|---------|------|
| 494 MOT | the bowl's right there |
| 495 EVE | by the sugar |

In (24), Adam uses a full determiner phrase with a definite article to clarify the referent that his mother was not able to identify from a demonstrative pronoun alone.

(24) Adam 2:6.3 (Brown 1973)

| ADAM | monkey get dat |
|------|----------------|
| MOT  | what? |
| ADAM | monkey get de penny |

In (25), from the same transcript, Adam uses a definite article to refer to a fireman that his mother has just introduced into the conversation.

(25)

| ADA | what dat fire engine doing |
|-----|----------------------------|
| MOT | there isn't a fire engine there |

| MOT | there's just a fireman on a ladder |
| ADA | what the fireman doing? |
| MOT | he may be going to help fight fire |

(26) provides a similar example from Peter (Bloom corpus)

(26) Peter 2:5.23

| 357 PETER | what's over there? |
| 358 LOIS | Sover there behind Jenny? |
| 359 PETER | yeah |
| 360 LOIS | that's a house |
| 361 PETER | who's go in the house |
| 362 LOIS | what !! goes in the house?? |
| 362 PETER | yeah |

In (27), from a later transcript, Peter uses a definite article phrase to refer to the people he is looking for, which, given Pat's response, are clearly familiar and therefore uniquely identifiable to her. If Peter had only been concerned about what is in focus for him, he could have used a personal or demonstrative pronoun here 'where they/ those', as he obviously is focused on what he wants to refer to. However, a pronoun would have been inappropriate, as there is no reason to assume that the people Peter is looking for are activated (i.e. in current awareness/working memory) for Pat.

(27) Peter 2:8.12

| PET | where the people? |
| PAT | they're in the big bag over there |
| PET | bag |
| PAT | the big brown bag |

(28), from the same transcript, is one of the few examples where a definite article is used for a referent that may be at most uniquely identifiable.

(28)

| PET | it's a big bulldozer |
| PAT | mhm |
| PET | a big bulldozer |
| PAT | a very big one |
| PET | here the wheels |

Although the wheels of the bulldozer could be activated for Pat, as they are in the immediate environment, there is no reason to think that all parts of the bulldozer are in her awareness. It is more likely that she would have to construct a new unique representation via a bridging inference to the in focus bulldozer. A definite article phrase, which the child used, is thus the only form that is appropriate in this context, as a pronoun or demonstrative determiner would require the wheels to already be in focus, activated, or familiar to Pat (*here they/those are, *here are those wheels).

The following is one of the rare cases of a possible misuse of the definite article.

(29) Peter 2:5.23
    *( Lois puts her wall back in house)*
    4302 PET      it's the guitar!!
    4303 LOI      well I think's it's gonna be a wall right now
    4304 PET      it's the guitar!!
    4305 *(bringing Lois her guitar)*
    4306 PET      it's the guitar!!
    4307 LOI      oh well # I don't want to play the guitar any more

It's not clear whether Peter was identifying this as the wall he had pretended was a guitar earlier (example 16 above, from the same transcript). If it is not, then the definite article would be inappropriate, as there is no basis for Lois to uniquely identify the referent. It is likely, however, that this is the same wall that Peter presented to Lois as a guitar earlier, in which case it is a particularly sophisticated example of definite article usage for an entity that is at most familiar at this point.

*Indefinite article*
The indefinite article appears to be acquired later than the other determiners and pronouns. (30) is an example of Eve's resistance to using this form, even though she apparently has some understanding of when it should be used.

(30) Eve 1:11.8
    248 MOT      What do you want?
    249 EVE      I want sandwich
    251 MOT      You want what?
    252 EVE      a sandwich

| | | |
|---|---|---|
| 254 MOT | sandwich |
| 255 EVE | yeah |
| 257 MOT | well# what do you want to drink? |
| 258 EVE | want I want sandwich |
| 260 MOT | you want a sandwich? |
| 261 EVE | cheese sandwich |

Similar omission of the indefinite article is found in the earlier transcripts from Adam.

(31) Adam 2:4.3

| | |
|---|---|
| 178 ADA | truck# look |
| 179 MOT | <oh it's a truck> |
| 180 ADA | oh no busy bulldozer |
| 181 MOT | <oh no #it's a busy bulldozer> |
| 182 ADA | dat busy bulldozer#truck |

(32) Adam 2:6.3  *(shows to Richard)*

| | |
|---|---|
| 539 ADA | penny in there |
| 540 *(shows to Richard)* | |
| 541 ADA | look it penny in there |
| 542 *(shows to Richard)* | |
| 543 RIC | do you have a penny in there? |
| 544 ADA | in there |
| 545 ADA | get it |
| 546 ADA | what that penny in there |

When the indefinite article is used, however, it is used correctly, and in contexts where a form that requires a higher status would be inappropriate.

(33) Eve 2:2

| | |
|---|---|
| EVE | I want my spoon |
| MOT | well# you have to have your spoon, yes |
| COL *( gets spoon for his coffee)* | |
| MOT | now you want a spoon # Eve |
| EVE | Fraser and Colin <have a > has a spoon for he cup |
| MOT | that's right |

(34) Adam 2:6.3

| | |
|---|---|
| MOT | is that your garage? |
| ADA | that's a little garage |

In (33), a definite article 'Fraser and Colin has the spoon …' would have been inappropriate, as this is not a uniquely identifiable spoon, in fact it may not even be used referentially. Similarly, in (34) Adam is saying that the garage his mother is referring to belongs to the type 'little garage'. He is not equating it with any particular garage.

## IMPLICATIONS FOR THEORY OF MIND

While the research reported here is far from conclusive, it does show that children use the full range of determiners and pronouns that encode cognitive status, and use them appropriately, by the time they are 3. Moreover, these children are capable of using referring forms in a way that strongly suggests they are sensitive to the memory and attention state of their interlocutors.[7] Personal pronouns are used almost exclusively when the referent is clearly in focus for the addressee; most definite article and demonstrative uses are for entities that are at least activated, though often not in focus; and there are occasional uses of the definite article before the age of 3 for at most uniquely identifiable or familiar entities. As noted above, these results are corroborated by other investigations of spontaneous conversation between children and adults as well as by recent experimental work which shows that children aged 3 and younger are able to appropriately choose and interpret referring forms based on their interlocutor's attention. In some sense, then, there is evidence that children are aware of, and sensitive to, the mental states of others before the age of 3.

The term 'theory of mind' has been used for a wide range of phenomena, which have in common the ability to ascribe to others various mental states that may be different from one's own. It has also been associated more narrowly with performance on tasks which test the ability to predict the behavior of others based on assessment of beliefs which may be false (e.g. Wimmer and Perner 1983). Such 'false belief' studies with children all over the world have shown that 3-year-olds are not able to verbally attribute beliefs to others that are different from their own beliefs. For example, if they know a toy is in the blue box, they will say that someone else thinks it is in the blue box as well, even if the other person has no basis for that belief and in some cases has reason to believe otherwise. Children aged 4 and older, however, attribute to others beliefs they expect them to have based on their own experience, even if

these are different from what the child knows to be true.

In what ways, then, is the kind of mind-reading ability involved in use of referring forms more like mind-reading abilities such as joint attention, that have been shown to develop before age 4 (and even before age 2)[8] and less like the kind of mind-reading ability involved in false-belief tasks, which typically develops after age 4? First, the mind-reading abilities involved in children's use of referring forms in naturalistic settings are measured on the basis of the children's spontaneous linguistic behavior (their appropriate use of the different forms); they are thus implicit and relatively automatic. By contrast, the abilities involved in the false belief tasks are measured by children's ability to reflect on and verbally attribute mental states or likely actions to others; they are thus arguably representational and explicit. The significance of this distinction is supported by results of studies that don't require children to verbalize beliefs. For example, Clements and Perner 1994 show that while 3-year-olds lack the ability to verbally attribute false beliefs to others, they do show an implicit ability to recognize false beliefs by looking to the place where they think people with such beliefs will look. Similarly, Repacholi and Gopnik 1997 show that children as young as 18 months are able to assess and act on other people's likes and dislikes by watching the expression on their faces. More recent studies of children's suggestibility and ability to assess speaker reliability also provide evidence that 3-year-olds who can't provide a verbal report of sources of their belief can decide who to believe and who not to believe at the time of input (e.g. Robinson and Whitcombe 2003). A related, and also possibly relevant, distinction is that the ability to assess epistemic states such as beliefs involves attributing propositional states to others, whereas the ability to assess cognitive statuses such as familiarity, focus of attention, or even ability to construct a unique representation, does not. The ability to use referring forms appropriately before age 3 is thus consistent with findings that children are able to correctly infer some mental states (e.g. intention, attention, and desire) before they exhibit the ability to verbally report on others' (false) beliefs and likely actions based on those beliefs, as required in the false belief tasks.[9]

A final distinction that may be relevant here is that between conceptual information, typically encoded by open class items such and nouns and verbs, and procedural information, typically encoded by closed class items such as grammatical particles. Matsui et al. 2006 found that Japanese children were better able to make use of information about evidentiality (i.e. a speaker's certainty with respect

to some expressed proposition) when it was encoded by sentence final particles than when it was encoded by epistemic verbs such as 'know' and 'believe'. Matsui et al. note that closed class items typically encode non-representational, procedural information; they only manipulate representations and as such, are less accessible to consciousness and more implicit and automatic. Open class items, on the other hand, are declarative, representational and explicit, and therefore more accessible to conscious awareness and less automatic. Determiners and pronouns which encode cognitive status are arguably more like the sentence final particles in this study than like verbs in that they are closed class and the information they encode (e.g. 'associate a representation from memory') is more procedural than conceptual.

# CONCLUSIONS

The Givenness Hierarchy theory proposed by Gundel, Hedberg and Zacharski allows a principled account of the distribution of different forms of referring expression both within and across languages, and contributes to an explanation of how the intended interpretation of a referring expression is understood, given that the descriptive content encoded in the phrase rarely, if ever, uniquely determines a single interpretation. If this account is correct, the appropriate use of referring expressions involves the ability to take into account the mental states of others in at least two ways: (1) the ability to appropriately assess what cognitive status the intended interpretation has for the addressee at a given point in the discourse, e.g. whether it is in focus, activated, or familiar, and (2) the ability to assess how much information is sufficient and relevant for the addressee, both information about cognitive status (e.g. is it relevant to explicitly signal that the referent is familiar) and information about conceptual content (e.g. is it relevant to refer to an object as 'the red ball' or is it enough to simply refer to it as 'the ball'). We have suggested that the ability described in (1), which is necessary for assessing the appropriateness of using a particular determiner or pronoun, is implicit, non-propositional and relatively automatic; it corresponds to a kind of mind-reading ability that develops at a relatively early age in children (see Baron-Cohen 1995; Tomasello and Haberl 2003). This would explain why children by the age of 3 are able to use the full range of cognitive status signaling forms more or less correctly. The ability described in (2), on the other hand, appears

to require more conscious reasoning about the epistemic states of others, and as such corresponds to a kind of mind-reading ability that is typically not fully developed until after the age of 4. This would explain the relatively late sensitivity to scalar implicatures in children, including the high frequency of demonstratives. If this account is correct, we would also expect younger children to be less competent in making decisions about how much descriptive/conceptual content is necessary in producing referring forms in different situations. Nadig and Sedivy 2002 found that 5- to 6-year-olds show robust evidence for taking the addressee's perspective into account both in production and understanding of referring forms. When presented with 4 objects in an array, they were more likely to use a descriptive adjective when more than one object of the same type (e.g. a big glass and a small glass) was visible to the adult than when they could see that one of the objects was blocked from the adult's view. They also were faster at understanding less descriptive referring expressions (e.g. the glass vs. the tall glass) when they could see that one of the objects of the same type was not visible to the adult. If the account we have proposed here is on the right track, we would expect children younger than 4 to perform significantly less well on such tasks.

There is clearly much more empirical work to be done in analyzing children's production and understanding of referring forms in both naturalistic settings and controlled experiments. It is evident however that more fine-grained and primitive notions than salience, accessibility and given vs. new information are needed to serve as a fruitful basis both for investigating the development of children's abilities to produce and understand referring forms and for understanding the role of theory of mind in this development.

# ENDNOTES

to collaborators on earlier related papers (in particular, Kaitlin Johnson, Melinda Kowalsky, Dimitris Ntelitheos, Sherri Page, and Maria Sera) for their contributions.

[2] *it* stands for all unstressed personal pronouns, *SHE* for all stressed personal pronouns, *this* for both *this* and its plural *these*, *that* for both *that* and its plural *those*, and *N* for a noun phrase complement of a determiner such as *the, a* or *this*. Following current practice in some syntactic frameworks, I will use the term 'determiner phrase' to refer to full nominal expressions such as *it, that , a restaurant, the restaurant,* and will reserve the term 'noun phrase' for the complement of a determiner, e.g. restaurant in *the* restaurant or new Chinese restaurant in *that* new Chinese restaurant. Within this framework, forms such as *it* may be analyzed as determiners with no noun phrase (NP) complement. However, to avoid confusion, I will continue to use the more traditional term 'pronoun' to refer to such forms. Thus, forms such as *that* will be called 'pronouns' in *that* is good, but 'determiners' in *that cake* was good.

[3] The Givenness Hierarchy is not, however, a hierarchy of degrees of accessibility in the sense of Ariel 1988, 1990, for example. This is so for two reasons. First, the statuses are in a unidirectional entailment and are therefore not mutually exclusive, since each status entails all lower statuses (statuses to the right). Second, referents of forms that encode statuses lower on the hierarchy are not necessarily more difficult to access than referents of forms that encode higher statuses. For example, an entity that is at most uniquely identifiable (uniquely identifiable, but not familiar), and thus requires the addressee to construct a new unique representation, may be easier to access than one that is at most familiar (familiar, but not activated) and must therefore be retrieved from long term memory. The Givenness Hierarchy framework does predict, however, in agreement with Ariel and others, that referents of pronouns which encode the two highest statuses (in focus and activated) are the most accessible, given generally accepted views that entities already in working memory will be easier to access than ones that are not and entities in focus of attention will be the easiest to access.

[4] This is evidenced also by the fact that 'Look, *that* man is hitting *the* dog' or '*The* man is hitting *that* dog', '*The* man is hitting *a* dog', etc. would all be equally appropriate in this context. Thanks to David Oshima, who sat in on my course on reference at the 2007 Linguistics Institute at Stanford, for calling this example to my attention.

[5] Examples in this paper are from the Brown, Bloom, and Valian corpora, all obtained from the CHILDES database (MacWhinney 2000)

[6] It should be noted that Gundel and Johnson 2008 did not find examples of overuse of demonstratives in the transcripts from the Valian 1991 corpus. This may be due to individual differences, or the fact that only 5 transcripts

were analyzed in this study. It may also be due to the fact that, unlike in the conversations recorded for the Brown and Bloom corpora, there was always an investigator present who was not the child's caregiver. The interactions were thus less spontaneous, and more controlled by the adult, as reflected also in the fact that the children talked less in these transcripts and rarely initiated new topics.

[7] This is not to say, of course, that children (like adults) can't be so absorbed in something that they fail to take into account the memory and attention states of their interlocutors, or that they may not even do so more frequently than adults, who are more experienced in interacting with others. The interesting thing is not that children don't always consider the mental state of their interlocutors when they use referring forms, but that most of the time they do.

[8] See Tomasello and Haberl 2003, for example.

[9] Cf. Baron-Cohen's 1995 steps 3 and 4 in the development of theory of mind. Step 3, the Shared Attention Mechanism (SAM), like the ability to assess cognitive statuses, is not propositional. Its function is to build 'triadic representations', specifying the relations between agent, self, and a third object (p. 44). Step 4, Theory of Mind Mechanism (TOMM), is a system for 'representing the set of epistemic mental states', such as *belief* (p. 51).

# REFERENCES

Ariel M (1988) Referring and accessibility. Journal of Linguistics 24:67-87

Ariel M (1990) Accessing noun phrase antecedents. Routledge, London

Baron-Cohen S (1995) Mindblindedness: an essay on autism and theory of mind. MIT Press

Bennett-Kastor T (1981) Noun phrases and coherence in child narratives. J Child Lang 10:135-149

Bittner D (2002) Emergence of grammatical complexity and markedness in the acquisition of verb and noun phrases in German. In: Dziubalska-Kolaczyk K, Weckwerth J (eds) Future challenges for natural linguistics. Lincom, Vienna, pp 25-56

Bittner D (2008) Early functions of definite determiners and DPs in German first language acquisition. In: Leiss E, Stark E (eds) On definiteness and determiners. John Benjamins, Amsterdam

Bloom L (1970) Language development: form and function in emerging grammars. MIT Press, Cambridge, MA

Brown R (1973) A first language. Harvard University Press

Clements WA, Perner J (1994) Implicit understanding of belief. Cogn Dev 9:377-395

Emslie HC, Stevenson RJ (1981) Pre-school children's use of the articles in definite and indefinite referring expressions. J Child Lang 8:313-328

Grice HP (1975) Logic and conversation. In: Cole P, Morgan J (eds) Speech acts. Academic Press, New York, pp 41-58

Gundel JK, Hedberg N, Zacharski R (1988) On the generation and interpretation of demonstrative expressions. Proceedings of the XXIInd international conference on computational linguistics. John Von Neumann Society for the Computing Sciences, Budapest, pp 216-221

Gundel JK, Hedberg N, Zacharski R (1989) Givenness, implicature, and demonstrative expressions in English discourse. Chicago Linguistic Society 25(2):89-103

Gundel JK, Hedberg N, Zacharski R (1993) Cognitive status and the form of referring expressions in discourse. Language 69:274-307

Gundel JK, Johnson K (2008) Informativeness, cognitive status, and children's use of pronominal forms in spontaneous conversation. Paper presented at annual meeting of IASCL (International Association for the Study of Child Language) Edinburgh, July 30, 2008

Gundel JK, Mulkern A (1998) Quantity implicatures in reference understanding. In: Kronfeld A, Roberst L (eds) The concept of reference in the cognitive sciences. Special issue of Pragmatics and Cognition, pp 21-46

Gundel JK, Ntelitheos D, Kowalsky M (2007) In Bittner D, Gagarina N (eds) ZAS Papers in Linguistics 48. Special Issue on Intersentential Pronominal Reference in Child and Adult Language, pp 1-22

Gundel JK, Page S (1998) The givenness hierarchy and children's use of referring expressions. Paper presented at the Annual Meeting of the Linguistic Society of America, January 6, 1998

Gundel J, Sera M, Page S (1999) The acquisition of referring expressions in English and Spanish. Paper presented at the Child Language Research Forum, Stanford, April 10, 1999

Gundel J, Sera M, Page S, Kowalsky M (2001) Cognitive status, implicature, and children's use of referring forms in English and Spanish. Poster presentation. Society for Research in Child Development Annual Meeting, Minneapolis, May 2001

Hawkins J (1991) On (in)definite articles. Journal of Linguistics 27:405-42

Hernandez-Pina (1994) Early morphological development. The acquisition of articles in Spanish. In Sokolov JL, Snow CE (eds) Handbook of Research in Child Development using CHILDES. Lawrence Erlbaum Associates

Hickmann M (2003) Children's discourse. Person, space and time across languages. University Press, Cambridge

Horn LR (1972) On the semantic properties of logical operators in English. UCLA dissertation, Los Angeles

Karmiloff-Smith A (1981) A Functional Approach to Child Language. Cambridge University Press

MacWhinney B (2000) The CHILDES project: tools for analyzing talk. Lawrence Erlbaum Associates, Mahwah, NJ

Maratsos M (1974) Preschool children's use of definite and indefinite articles. Child Dev 45:446-455

Maratsos M (1976) The use of definite and indefinite reference in young children. University Press, Cambridge

Matsui T (1995) Bridging and reference. London dissertation, University College, London

Matsui T, Yamamoto T, McCagg R (2006) On the role of children's early understanding of others as epistemic beings. Cogn Dev 21:156-173

Matthews D, Lieven E, Theakston A, Tomasello M (2006) The effect of perceptual availability and prior discourse on young children's use of referring expressions. Applied Psycholinguistics, pp 403-422

Nadig AS, Sedivy JC (2002) Evidence of perspective-taking constraints in children's on-line reference resolution. Psychol Sci 13(4):329-336

Noveck IA (2001) When children are more logical than adults: experimental investigation of scalar implicature. Cognition 78(2):165-188

Ntelitheos D, Manorohanta C (2004) Case and the acquisition of the pronominal paradigm in Malagasy. Unpublished ms. UCLA

O'Neil DK (1996) Two year old children's sensitivity to a parent's knowledge. Child Dev 67:659-677

O'Neil DK (2005) Talking about "new information." The given-new distinction and children's developing theory of mind. In: Astington JW, Baird JA (eds) Why language matters for theory of mind. Oxford University Press, pp 84-105

Papafragou A, Musolino J (2003) Scalar implicatures: experiments at the semantics-pragmatics interface. Cognition 86(3):253-282

Premack D, Woodruff G (1978) Does the chimpanzee have a theory of mind? Behav Brain Sci 1:515-526

Repacholi BM, Gopnik A (1997) Early reasoning about desires. Evidence from 14- and 18-month-olds. Dev Psychol 33(1):12-21

Robinson EJ, Whitcombe E (2003) Children's suggestibility in relation to their understanding about sources of knowledge. Child Dev 74:48-62

Sperber D, Wilson D (1986/95) Relevance. Communication and cognition. 2nd ed Harvard University Press, Cambridge, MA

Tomasello M, Haberl K (2003) Understanding attention: 12- and 18-month-olds know what is new for other persons. Dev Psychol 39:906-912

Valian V (1991) Syntactic subjects in the early speech of American and Italian children. Cognition 40, 21–81

Verbuck A (2007) Why children do not compute irrelevant scalar implicatures. Paper presented at the Annual Meeting of the Linguistic Society of America, Anaheim, CA, January 7, 2007

Wilson D (1992) Reference and relevance. UCL Working Papers in Linguistics, pp 167-189

Wimmer H, Perner J (1983) Beliefs about beliefs: representation and constraining function of wrong beliefs in young children's understanding of deception. Cognition 13:103-128

Wittek A, Tomasello M (2005) Young children's sensitivity to listener knowledge and perceptual context in choosing referring expressions. Appl Psycholinguist 26:541-558