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'Maybe my daddy give me a big piano': the development of children's use of modals to express uncertainty*

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ABSTRACT

Little is known about the emergence of modal adjuncts to mark uncertainty. We used the CHILDES database (MacWhinney & Snow 1985, 1990) to examine the use of the modal terms *maybe, possibly, probably* and *might* among 10 children between ages 2;0 and 4;11. A coding scheme was developed to permit a detailed examination of the contexts in which these terms were used. Children first expressed uncertainty in connention with ongoing events in the physical world and with respect to future intentions. The expression of uncertainty with respect to future events was the next context of use to emerge. After age 3;6, an increased use of *might* was notable, particularly with respect to 'things that might happen' in the future.

We are gonna ... at the ocean.
Ocean is a little far away.
Baw, baw, buh [etc.] far away ...
I think it's ... couple blocks ... away.
Maybe it's down, downtown,
and across the ocean,
and down the river,
and *maybe* it's in, the hot dogs will be in a fridge ...

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and the fridge (would) be in the water over by a shore,
and then we could go in,
and get a hot dog and bring it out to the river,
and then the sharks go in the river and bite me,
in the ocean, we go in the ocean,
and the ocean be over by . . .

Emily, aged 28 months (from Nelson 1989*a*, italics added)

The narrative above is a monologue produced by a 28-month-old girl named Emily before going to sleep. It is one of many monologues recorded by her parents when she was between the ages of 21 and 36 months. These recordings, which also include bedtime conversations with her parents, were initially studied by a number of scholars of child language and cognitive development whose findings were presented in *Narratives from the Crib* (Nelson 1989*b*). A striking feature of the monologue above is Emily's frequent use of the modal uncertainty marker *maybe*. Emily's uncertainty at the time of narrating this particular monologue about going to the ocean appears well justified when we learn from Nelson (1989*a*) that her parents had not, in their previous discussions with her about this upcoming trip, mentioned any details such as refrigerators, car seats, or which car they would drive. Nor had Emily had any previous experience going to the beach or eating a hot dog.

Nelson (1989*a*) notes that many of Emily's monologues involved such questions as "'what might happen" (but is uncertain), "why did x happen?" (or will it happen again?), "what did Mommy/Daddy/other say/do and what did it mean?"' (p. 29), and were marked by phrases such as *maybe* and *I don't know*. Other researchers have also noted Emily's use of uncertainty markers. Bruner & Lucariello (1989) found that approximately 18% of her monologues contained uncertainty markers such as *maybe*. Similarly, Feldman (1989) found that Emily used modals such as *maybe* and *probably*, and epistemic adverbs such as *actually* and *certainly*, over three times as often in her 'problem solving narratives', which she produced when she was faced with a contradiction or state of affairs she did not fully understand, than in her dialogues with her parents or in her more past-oriented monologues reviewing the day's events.

In addition to Emily's frequent use of the term *maybe*, another striking feature of her monologues, with respect to her use of this term, is the wide variety of contexts in which she uses it. For example, as noted by Feldman (1989) and Nelson (1989*a*), Emily's utterances

containing the word *maybe* involved her trying to understand both past events (e.g., 'maybe tree fell down and broke that crib') as well as events to come (e.g., 'maybe when my go to Tanta's might get some soap to put on my hands'). In addition, her utterances marked uncertainty with respect to actions, events and states in both the psychological and physical world. That is, some of her utterances concerned uncertainty regarding the voluntary intentions or actions of herself or another person (e.g., 'maybe Daddy come back here'). But other utterances, such as 'maybe it's [the ocean] down, downtown', concerned uncertainty or speculation about a state of the world that was outside of her (or anyone's) control. Emily used *maybe*, therefore, both to indicate uncertainty with respect to psychological events such as the intentions of others, and to express uncertainty about aspects of the physical world.

In English, a speaker's uncertainty concerning the truth of the propositional content of his or her utterance can be marked in a number of ways, including the use of adverbs to convey relative frequency (e.g., *often, seldom*), the use of factive versus nonfactive verbs (e.g., *know* vs. *think*), and the use of modal auxiliaries and adjuncts (e.g., *can*, *could*, *maybe*, *might*, *possibly*, *will*) (Byrnes & Duff 1989, Green 1984, Moore, Bryant & Furrow 1989). Of these three means of communicating uncertainty, the earliest to emerge in children's language is the use of modal auxiliaries and adjuncts. (For reviews of modal acquisition see: Bloom, Tackeff & Lahey 1984, Brown 1973, Gerhardt 1991, Shatz & Wilcox 1991, Shields & Steiner 1972, Stephany 1986, Wells 1979, 1985.) As such, they represent a logical starting point for examining children's developing concept of uncertainty. Moreover, with respect to conveying uncertainty, the use of modal auxiliaries and adjuncts has received little prior study compared with both the use of adverbs to convey relative frequency and the use of factive versus nonfactive verbs (e.g., Green 1984, Kuczaj 1975, Moore & Davidge 1989). It should be noted, however, that the category of modal auxiliaries and adjuncts incorporates a wide range of concepts that children acquire gradually (Bliss 1988) and which are not all used to indicate uncertainty. For instance, the modals *can*, *must*, *should* and *will* are generally regarded as being used more often to convey nonepistemic meanings (often referred to as deontic meanings) reflecting ability, necessity, intention, permission, and/or obligation (e.g., Bliss 1988, Fletcher 1979, Kuczaj 1982, Wells 1985) than epistemic meanings such as possibility, probability and uncertainty (Fletcher 1975). In the present study, we chose to limit our examination to those modals generally agreed upon by previous researchers to express uncertainty with respect to the

likelihood of an event, namely, the modal adjuncts *maybe*, *probably* and *possibly*, as well as the modal auxiliary *might* (e.g., Bliss 1988, Green 1979, Moore, Pure & Furrow 1990).

Little is known about the emergence of modal adjuncts and auxiliaries such as *maybe*, *probably*, *possibly* and *might* to mark uncertainty. A few studies, in addition to those based on Emily's narratives, have reported the use of such terms among children younger than three years of age, although these adjuncts were not the main focus of investigation (Bowerman 1986, Stephany 1986). For example, in examining the acquisition of conditionals, Bowerman (1986) states that, by the age of 2 or soon after, all three children she studied had started to indicate uncertainty through the use of terms such as *maybe*, *probably* and *might*. Their utterances included, for instance, 'I might fall and cry' and 'Missy inside maybe?' In her review of research on modality, Stephany (1986) provides examples of similar modalized constructions in Finnish and Turkish produced by two-year-old children. The present study is the first, however, to focus exclusively on the emergence of these modal adjuncts among a larger group of children. It is also the first to conduct a detailed examination of the contexts in which these terms are used by young children to denote uncertainty. Our investigation is intended to provide a clearer picture of how children's notion of uncertainty originates and develops.

The development of an understanding of uncertainty is of interest for many reasons. First, uncertainty is a fact of life. Life is filled with uncertainty, and for many events the best we can do is assess, with more or less confidence, the likelihood of their occurrence. Second, the recognition of uncertainty represents a milestone in children's development (for further discussion, see Piaget & Inhelder 1951, and Flavell 1963). With this recognition comes a fuller appreciation of the distinction between two types of events in the world: those that are certain and lawful, such as balls falling down rather than up, and those that entail uncertainty, such as whether it will be sunny tomorrow. As children grow older they also come to assess events and states in the physical and psychological world along the continuum from certain to uncertain. The recognition of uncertainty may also mark a newly acquired state of metacognitive awareness. That is, it may indicate the beginning of an ability to contemplate whether one's own knowledge comes from a relatively reliable source (e.g., one's own direct perception/experience of an event) or from a potentially less reliable one (e.g., indirect experience of an event such as being told about it by someone else). As such, an understanding of uncertainty belongs not only within the realm of children's language development, but also

within the realm of children's developing theory of mind (e.g, Astington, Harris & Olson 1988) along with such concepts as intention, pretence, false belief and source knowledge (for a similar view, see Moore *et al.* 1989). A grasp of uncertainty is also crucial to an understanding of the concept of the future, as all future events and activities, including the statement of intentions, the making of predictions, the efforts of planning and the consideration of possible and hypothetical alternatives, necessarily entail uncertainty. Finally, the emergence of children's understanding of uncertainty may represent one of the earliest prerequisites for logical and scientific reasoning, inferential judgement and decision-making.

In the present study, we used the CHILDES database (MacWhinney & Snow 1985, 1990) to examine the use of the modal terms *maybe*, *possibly*, *probably* and *might* by ten children between the ages of 2 and 5 years whose conversations with their family members were recorded and transcribed by various linguists.[1] From our review of the literature, we expected to be able to classify the use of these modal terms along at least three dimensions related to their context of use: (1) whether the event or state being marked as uncertain was in the past, present or future; (2) whether the event or state was related to the physical or psychological world; and (3) whether the event or state pertained to the self, to another person or to neither (e.g., was about an object, animal or physical state/event). Given the scarcity of research on the topic, we had limited predictions concerning the developmental sequence within each of these three dimensions. First, we predicted that uncertainty would be marked more often in connection with future events (e.g., 'maybe we'll go and see grandma') than past events, as the former seem more common in naturalistic conversation. Second, given that many aspects of children's theory of mind are believed to progress from an understanding rooted largely in the physical world to one encompassing the psychological world (e.g., for a review see Wellman 1993), we thought it likely that the same pattern might hold for children's developing understanding of uncertainty. Finally, given the evidence to date, we made no predictions regarding the developmental sequence with respect to talking about uncertainty in relation to the self or to

[1] The modal adjunct *perhaps* was not included in this study because previous research did not identify this term as one frequently observed to be used by children under 5 years of age (e.g., Green 1979, 1984). In response to a reviewer's query, we re-analysed our data and, indeed, found only two instances in which this term was used. The results as presented, however, do not include these instances of *perhaps*.

others. For example, only one study suggests that children use modals initially in reference to the self and only later with reference to other people (Fletcher 1979). Moreover, among theory of mind researchers, no consensus exists as to whether some concepts are understood first with respect to the self and only later with respect to others (e.g., Gopnik 1993).

METHOD

Participants

The transcripts from the following ten children included in the CHILDES database (MacWhinney & Snow 1985, 1990) were examined: Adam, Eve and Sarah (Brown 1973), Abe (Kuczaj 1977), Ross and Mark (contributed by Brian MacWhinney), Allison (Bloom 1973), Peter (Bloom 1970), Nathaniel (contributed by Catherine Snow), and Naomi (Sachs 1983). All are first-borns except Mark, who is second-born. Adam is black and all other children are white. All the children are from middle-class families, with the exception of Sarah who is from a working-class family. These are the same ten children whose language involving mental states was studied by Bartsch & Wellman (1995). We chose to include only the transcript data collected when a child was between 2;0 and 4;11 years of age. Table 1 indicates the collection procedures and amount of data available from each child.

The total number of samples within the age range of our study was 598. For many of our analyses we blocked the data into six 6-month age groups: 2;0–2;5, 2;6–2;11, 3;0–3;5, 3;6–3;11, 4;0–4;5, and 4;6–4;11. The number of children from whom we have data available in each of these time periods is listed in Table 2. Note that Kuczaj (Kuczaj & Maratsos 1975) was interested in Abe's use of modal auxiliaries and Sachs (1983) was interested in Naomi's use of displaced reference, which may have influenced the type of talk encouraged by these parents. However, in neither of these two cases were the modal adjuncts studied here the focus of initial or subsequent investigation.

Procedure

The transcripts were searched via computer, using the Computerized Language Analysis (CLAN) program (MacWhinney 1995), for all child utterances containing the target modal terms. For each child a record of all the child's utterances which contained a target modal term was obtained. Following the procedure of Bartsch & Wellman (1995), each utterance was printed, together with a conversational window that included the four preceding and three succeeding utterances. Using this procedure, 608 instances of the target terms were isolated.

TABLE 1. *Description of collection procedures and data available from each of the ten children from age 2;0 to 4;11*

Child	Contributor	Collection procedure in hours per week(s)	Available data, 2;0–4;11	No. samples, 2;0–4;11
Adam	Brown (1973)	1 or 2 h/2 weeks	2;3–4;10	55
Abe	Kuczaj (1977)	1 h/week, 2;4–4;0; 0.5 h/week, 4;1-5;0	2;4–4;11	208
Sarah	Brown (1973)	0.5 h/0.5–1 week	2;3–4;11	133
Ross	MacWhinney	multiple short episodes/2–3 weeks	2;6–4;11	35
Naomi	Sachs (1983)	1 h/2 weeks	2;0–4;9	59
Allison	Bloom (1973)	0.75 h/4–8 weeks	2;0–2;10	2
Eve	Brown (1973)	1 h/2 weeks	2;0–2;3	8
Nathaniel	Snow	1 h/week	2;5–3;9	30
Peter	Bloom (1970)	4 h/3 weeks	2;0–3;1	20
Mark	MacWhinney	multiple short episodes/2–3 weeks	2;0–4;11	38

TABLE 2. *Number of children providing data in each age group, the number of total uses of each target term (not including repetitions and uncodable utterances) and the total number of utterances available in the CHILDES database at each age level*

Age group	No. children	No. uses of target			Total no. uses of target terms	Total no. utterances
		maybe	*probably*	*might*		
2;0 - 2;5	9	10	1	0	11	37698
2;6 - 2;11	9	51	6	18	75	46728
3;0 - 3;5	8	85	5	29	119	38434
3;6 - 3;1	7	75	10	44	129	27735
4;0 - 4;5	6	67	2	44	113	21883
4;6 - 4;11	6	18	19	33	70	16007

Coding scheme

As we anticipated, children used these target modal terms in an extremely wide variety of situations relating to both the physical and mental world, as well as pertaining temporally to the present, past and future. Children also used the terms in relation to themselves and others. Furthermore, within the realm of the mental world, children

used the target modal terms in connection with an assortment of mental state verbs. None of the previous coding schemes for modals we considered was able to accommodate all of these uses (e.g., Bliss 1988, Byrnes & Duff 1989, Gee 1985, Groefsema 1995, Kuczaj 1982, Stephany 1986). Moreover, in many cases the individual classification categories used in previous work were found to be either too broad or too narrow for our purposes and not to result in good interrater reliability when we tried to apply them to our data.

The coding scheme we developed is shown in Table 3. Each utterance containing a modal term was categorized along the following three dimensions:

(1) Physical/Psychological

Each modal term was categorized as referring to uncertainty concerning either an event or state in the physical world that was not under an agent's control, or concerning (presumably controllable) intentions and other mental states in the psychological realm.

Physical Events/states classified as physical typically involved such things as the location, identity and physical attributes of objects or people. Events were also categorized as physical if an agent would not normally have any control over the outcome, even if his or her actions might have contributed to the outcome. For example, an event of someone falling was classified as pertaining to the physical world because, although the agent's actions may have contributed to the event (e.g., the person was walking on a thin beam), the outcome of falling was unintentional and not, in this sense, under his or her control.

Psychological Children's utterances classified as psychological were further subdivided as to whether they involved: (a) an intentional action (e.g., *make, try*), (b) a desire state (e.g., *want, like*), or (c) an epistemic state (e.g., *afraid, know*). Included in the desire category were physiological states (e.g., *hungry*). Included in the epistemic category were verbs of perception (e.g., *see, feel, hear*).

(2) Present/Past/Future

Children's use of a modal term was also categorized according to whether it pertained to an event/state in the present, past, or future. These temporal categories were defined as follows:

Present The modal term was applied to a physical or psychological event/state that was present or occurring at the time of the

TABLE 3. *Coding scheme for modal usage with example utterances from children's transcripts*

		Psychological		
	Physical	Intentional action	Desire	Epistemic
Present	physical event/ state is unintentional and is ongoing	intentional act is ongoing	physiological/ desire state is ongoing	emotion/ perception/belief is ongoing
	e.g., maybe it's dark	e.g., maybe he's visiting	e.g., maybe I want a knife	e.g., maybe Ursula can understand what he's saying
Past	physical event/ state is unintentional and is in the past	intentional act is in the past	physiological/ desire state is in the past	emotion/ perception/belief is in the past
	e.g., maybe the bell used to ring	e.g., maybe she did magic while I was sleeping	[no instances]	e.g., maybe you learned it from the bad preschool
Future	physical event/ state is unintentional and is in the future	intentional act is in the future	physiological/ desire state is in the future	emotion/ perception/belief is in the future
	e.g., what might happen?	e.g., probably I will go to that big sand pile	e.g., maybe he'll want it later	e.g., we might see him again

utterance (e.g., 'maybe he wants it'). Note that with respect to a mental state, such as a desire, it was the current presence of the state that determined its classification, not its content. For example, the utterance 'maybe she want to go to strange tunnel with us' was coded as pertaining to the present because the state of wanting was in the present (although the activity itself of going to the tunnel was in the future).

Past The modal term was applied to a physical or psychological event/state that occurred in the past (e.g., 'maybe it disappeared').

Future The modal term was applied to a physical or psychological state that had not yet been achieved (e.g., 'I might go to

Sean's house'). The verb in such cases was usually, though not always, accompanied by a modal auxiliary such as *will*.

(3) Self/Other/Neither

Finally, children's use of a modal term was coded as to whether it pertained to the self, to another person, or to neither. It should be noted that *we* was coded as referring to the self. 'Neither' generally captured uses that pertained to the physical world (e.g., 'maybe it's blue'), and, infrequently, uses that pertained to animals.

If an instance of use could not be interpreted clearly enough to permit classification on all three dimensions (even after referring back to the entire transcript if necessary), it was coded as uninterpretable, as was the case for 24 utterances (4%). Following the procedures of Shatz, Wellman & Silber (1983) and Bartsch & Wellman (1995), we also excluded any uses of the target modal terms that were repetitions of an adult's previous use of the term or self-repetitions (in which case only the first utterance was counted). The analyses to follow are based on the remaining 517 codable uses of the target modal terms. Four children, all boys, provided the bulk of the total number of coded utterances: Abe (39%), Mark (16%), Ross (15%) and Adam (14%). The remaining children each contributed less than 10% of the total number of utterances.

Reliability

Each utterance was coded independently by the second author. Subsequently, a sample of 30% of all utterances was coded independently by a developmental graduate student trained to use the coding scheme but blind to the hypotheses of the study. Percentage agreement between coders as to the classification of each utterance with respect to the physical/psychological and past/present/future was 94% for instances of *maybe*, 98% for instances of *might*, and 85% for instances of *probably*. Agreement was 100% as to whether the use of the target modal term applied to self, other, or neither, or was a repetition. Instances of disagreement were resolved through discussion or were classified as uninterpretable.

RESULTS

Of the total 517 uses of the target modal terms, 306 (59%) were *maybe*,

168 (32%) were *might* and 43 (8%) were *probably*. None of the children used the term *possibly*. The frequency of use of the target modal terms increased steadily from age 2;0 to 4;5, as shown in Table 2, but dropped off during the period 4;6–4;11, possibly due to the smaller number of total utterances during this period (albeit the relative frequency of the target terms does not change dramatically compared with the prior time period). Children ranged in age from 2;1 to 3;2 when their first use of a target modal term occurred. The first term used was *maybe* for six children, *might* for three children and *probably* for two children.

Because of differences in the total number of utterances at each age group, we present the results in terms of the proportion of utterances observed in each of the 12 categories out of the total number of utterances containing a target modal term at each age level (see Figs 1–6).[2] The major findings will be described for each age group in turn.

Ages 2;0 to 2;5

Use of the target modal terms was found to be very infrequent before age 2;6, with only 11 instances observed during the period from 2;0 to 2;5, and so these results should be interpreted with caution. Children's use of the modal terms was confined largely to two contexts, the *present physical* and *future intention* (see Fig. 1). Examples of children's utterances concerning ongoing events/states in the physical world included 'maybe down that street', 'probably in there' and 'maybe it's Kimberly'. The majority of such utterances pertained to neither the self nor to others, as they were about events and states. Utterances which pertained to future intentions included 'maybe put that one on?' and 'maybe you finish that one?' Although three of these four utterances pertained to the self, the small number of observations should be kept in mind. The one instance of a future epistemic utterance was 'when we go to his home we maybe see it'.

Ages 2;6 to 2;11

Within the next six months, the frequency of children's use of the target

[2] An alternative procedure would have been to present the results in terms of a percentage of children's total utterances. However, given that these numbers are very small (all less than 1%, as can be calculated from the last two columns of Table 2) we have chosen, as have other researchers (e.g., Bartsch & Wellman 1995), to present our findings as percentages of total utterances containing a target modal term rather than percentage of total utterances. Doing so also allows us to easily show comparisons between utterances containing different types of modals.

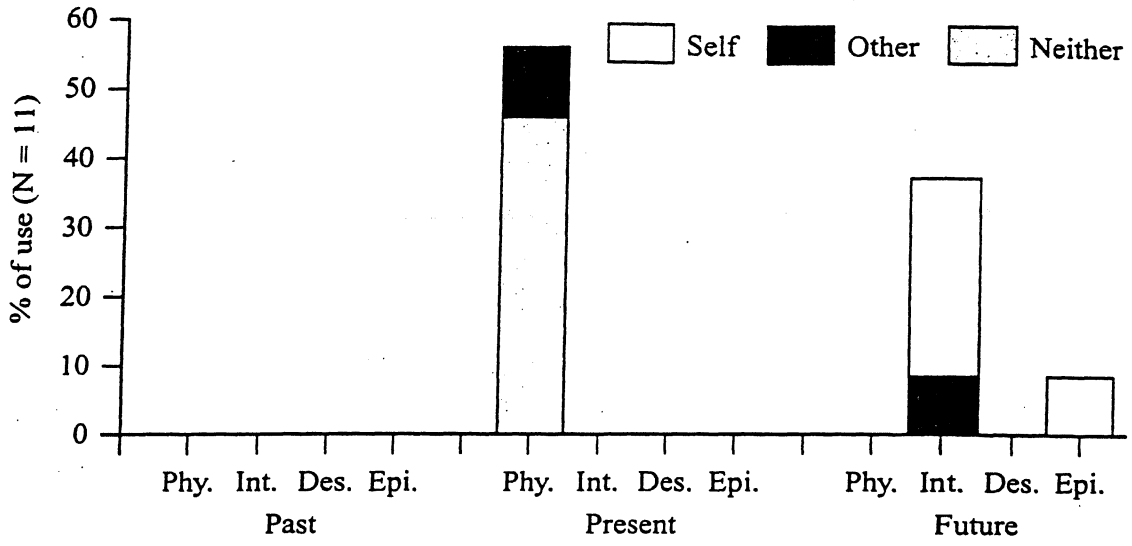

Fig. 1. The proportion of utterances in each of the twelve categories of use for children between the ages of 2;0 and 2;5 (abbreviations in Figs 1–6: Phy. = Physical, Int. = Intentional action, Des. = Desire, Epi. = Epistemic)

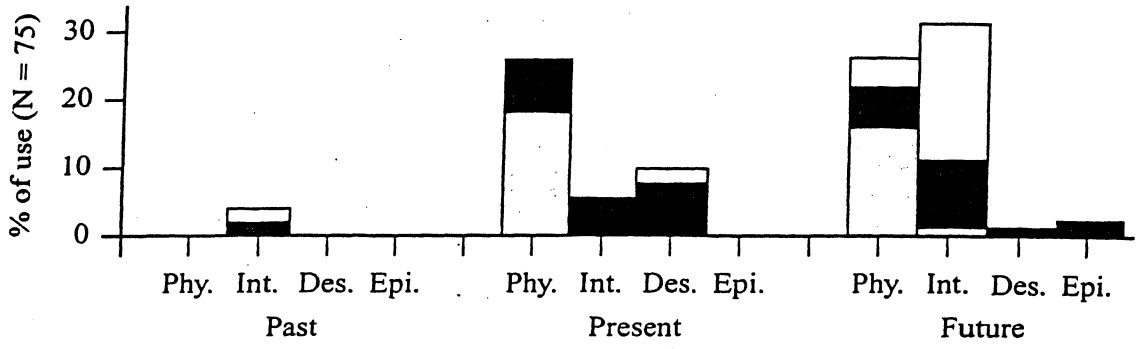

Fig. 2. The proportion of utterances in each of the twelve categories of use for children between the ages of 2;6 and 2;11

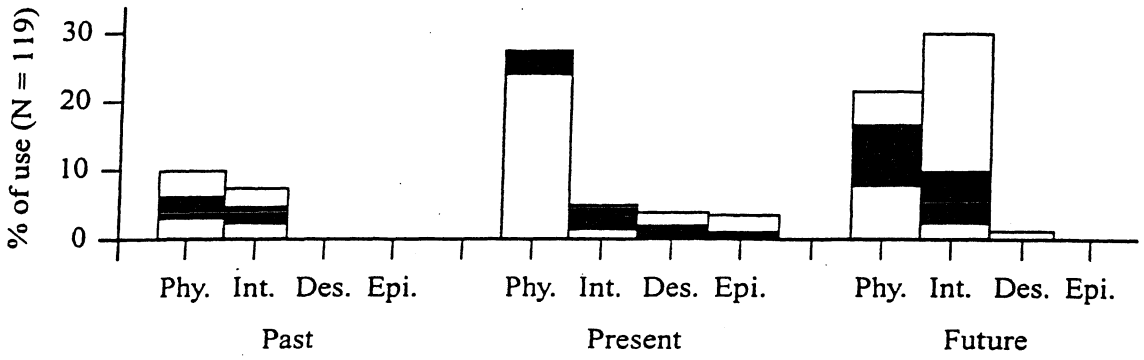

Fig. 3. The proportion of utterances in each of the twelve categories of use for children between the ages of 3;0 and 3;5

modal terms had increased almost seven-fold (see Table 2). Given that children's total number of utterances did not even increase two-fold from the earlier age group (see Table 2), this increase cannot be simply attributed to an increase in number of utterances produced overall. Fifty-five percent of children's utterances containing a modal term continued to pertain to the two contexts observed earliest, the *present physical* and *future intention* (see Fig. 2). Similar to the findings of the prior six months, the majority of utterances pertaining to the ongoing physical world did not reference the self or another person. Instances classified as *future intention* tended to pertain to the self (61%) such as 'maybe I'll go away', and 'maybe after we set these up', rather than to others (35%) such as 'maybe he can get this on'.

In addition to these two main categories of use, however, children had also expanded their use of the target modals to indicate uncertainty with respect to physical events in the future. Examples of such *future physical* utterances were: 'it might pop again', 'maybe these fit in here?', 'it might burn you' and 'may, maybe fall?' The majority (68%) of such utterances pertained neither to the self nor to others.

Although rare, use of the target modals with respect to desire states in the present (e.g., 'maybe she wants lunch') and future (e.g., 'maybe he'll want it later'), and the use of these modals with respect to intentions in the present (e.g., 'maybe building a tower') and past (e.g., 'maybe Jason took it home') was observed for the first time at this age.

Ages 3;0 to 3;5

From age 3;0 to 3;5, utterances such as 'I maybe lost it' and 'maybe it felled', indicating uncertainty with respect to physical events in the past were first observed (see Fig. 3). Such utterances pertained almost equally to the self, to others, or to neither. The first utterances categorized as *present epistemic* (e.g., 'he is maybe is afraid of') were observed at this age, albeit infrequently, as was one utterance pertaining to a child's own future desires. Overall, however, the most frequent category of use was *future intention*, especially with respect to the intentions of the self (see Fig. 3), followed by the *present physical* and *future physical*.

Ages 3;6 to 4;0

The three main categories of modal use from age 3;6 to 4;0 continued to be the *present physical, future physical* and *future intention* (see Fig. 4). Within these three categories, the distribution of utterances with respect to self, other, and neither showed little change from previous age periods, although children's utterances themselves demonstrated increasing

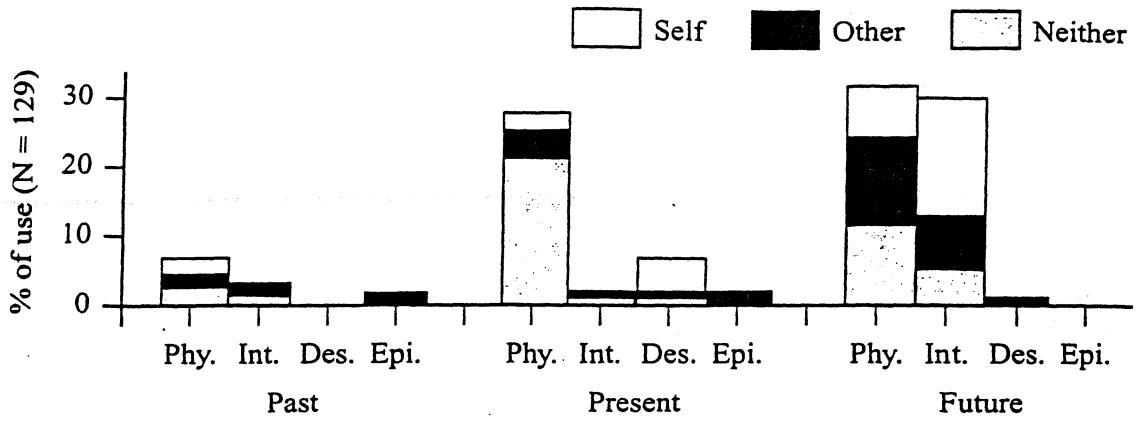

Fig. 4. The proportion of utterances in each of the twelve categories of use for children between the ages of 3;6 and 3;11

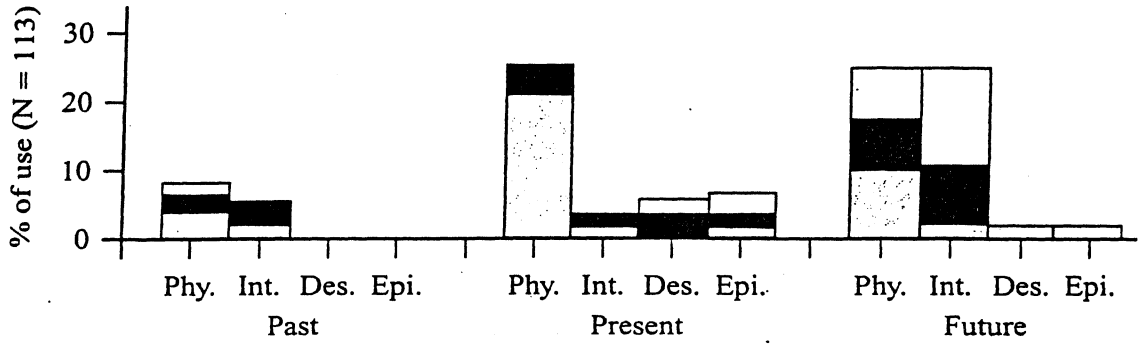

Fig. 5. The proportion of utterances in each of the twelve categories of use for children between the ages of 4;0 and 4;5

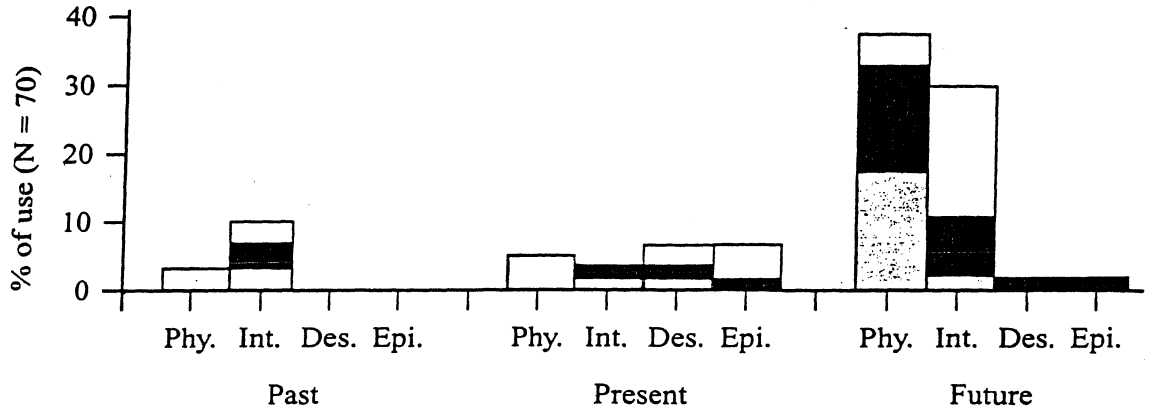

Fig. 6. The proportion of utterances in each of the twelve categories of use for children between the ages of 4;6 and 4;11

syntactical sophistication. For example, children's utterances pertaining to intentions in the future included: 'when mommy gets home, she will, maybe she will pick some of the dandelion parts off' and 'his big brother is probably going to take him to eat something'.

One modal term, *might*, appeared to be used with more regularity by this age. Of all the instances of *might* observed in total over the time period from 2;0 to 4;11, 72% occurred after the age of 3;6. These uses often appeared to reflect children's curiosity about things that might happen, as in the following utterances: 'I might catch the hiccups' and 'he might crash out of the road'. Might was also used in pretend and fantasy contexts of a kind rarely seen at earlier ages (e.g., 'we might turn into werewolves').

After the age of 3;6, the first uses of the modal terms in connection with past epistemic states were observed, such as 'maybe that's why you guys got the idea about spanking'. Overall, however, modals were still rarely used to express uncertainty with respect to mental states other than intentions.

Ages 4;0 to 4;5

Little change was seen during this period with respect to the main categories of modal use (see Fig. 5). The only new type of modal usage observed was the expression of uncertainty with respect to children's *own* epistemic states in the present, as in the utterance,' maybe I'm real right'. The increased use of *might* observed in the previous age period continued in this time period, and there appeared to be a trend emerging for it to be used mainly in *future physical* contexts. Fifty-five percent of the instances of *might* were coded as *future physical* and, moreover, uses of *might* comprised the largest percentage (92%) of all modal terms classified in this category. In contrast, for example, of the modal uses classified as *future intentional, maybe* comprised the largest percentage (69%).

Ages 4;6 to 4;11

The data from this time period should be interpreted with some caution, as the total number of utterances available in CHILDES was lower (see Table 2). The most notable development in this period was the continued use of *might* (see Fig. 6). Indeed, the proportion of *might* among all target modal terms increased steadily from 24% for age group 2;6–2;11 to 47% for age group 4;6–4;11. The following are examples of such utterances: 'if I shoot it, what might happen?', 'if you swallow that you might get dead right?', 'because some day I might have a bad cold and I couldn't go out', and 'you might cut off your

circulation'. Similar to the previous age period, the majority of instances of *might* (85%) were coded as *future physical* and its use comprised the largest percentage (79%) of all modal terms classified in this category. In contrast, among the next most frequent category of use, the *future intentional*, the distribution of use of the target modal terms was more varied (29% *maybe*, 29% *might* and 42% *probably*).

DISCUSSION

What kinds of situations or events might begin to foster children's awareness of alternative possibilities and hence a sense of uncertainty? We believe the results of this study suggest an answer to this question.

Among the ten children discussed here, the target modal terms were used infrequently before age 2;6. Nevertheless, throughout the period from 2;0 to 2;11, one of the first ways in which the children expressed uncertainty was through the use of modal terms in connection with ongoing events in the physical world, such as the location, identity and physical attributes of people and objects. The marking of uncertainty with respect to such events may represent an awareness that, even in the domain of the present, more than one possibility may exist. For example, dad might be at work or he might not be. At present, we cannot say whether this awareness of uncertainty is the result of entertaining multiple possibilities (e.g., dad might be at work, driving or at home) or more simple dichotomous possibilities (e.g., dad is at home or he is not at home). In our data, we did not find any compound utterances in which children raised numerous possibilities and so, at present, perhaps it is best to consider these early expressions of uncertainty as predominantly dichotomous in nature.[3] Also beginning in the first time period, and continuing between the ages of 2;6 and 2;11, was the use of modal terms to mark uncertainty with respect to intentions in the future, especially those of the self.

The use of modals to mark uncertainty with respect to future events/states in the physical world emerged between the ages of 2;6 and 2;11. These three categories of use – *present physical*, *future physical*, and *future intention* – remained the most frequent categories of use throughout the remainder of the age groups we examined. After the age

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[3] We thank Kevin Durkin for pointing out the need to be cautious about attributing to children an awareness of multiple possibilities and the suggestion to address this issue by examining our data for compound utterances mentioning more than one possible state of affairs.

of 3;6 the most notable development was the growth in the use of *might*, particularly in contexts classified as *future physical* where it, as opposed to another target modal term, was used 92% of the time. As reported, these uses often appeared to reflect 'things that might happen' of both a hypothetical and fantasy nature.

Our results do not show a developmental progression in the use of the target modal terms from contexts initially pertaining only to the physical world to later uses in psychological contexts. Rather, these modal uncertainty terms were used with respect to both these contexts from the beginning. However, given our findings, we can state that, within the realm of the psychological world, uses pertaining to intentions (of self and other) were much more frequent throughout the entire time period from 2;0 to 4;11 than uses relating to desires or epistemic states (including emotional states).

Although uncertainty was rarely expressed with respect to desire and epistemic states, between the ages of 3;0 and 3;11 the proportion of utterances expressing uncertainty with respect to desire states was larger (4.8%) than with respect to epistemic states (2.8%). The same was true between the ages of 4;0 and 4;11 (7.7% vs. 6.0%). The small number of such utterances may seem at odds with the general consensus among theory of mind researchers that children possess a belief-desire theory of mind by 4 years of age (e.g., Astington *et al.* 1998, Bartsch & Wellman 1995). However, it should be recognized that such utterances reflected not merely the expression of a desire or epistemic state, but the expression of uncertainty with respect to that state.

Our data also suggest that the expression of uncertainty through the use of modal terms does not progress from uses pertaining only to the self to uses that also pertain to others, or vice versa. Rather, the earliest utterances falling in the psychological realm concerned both self and other. There did appear to be a general trend across all the age groups, however, towards more frequent talk about the future intentions of the self rather than those of others. And within the realm of the physical world, the majority of utterances at all ages pertained to neither the self nor others, but to the category labelled as *neither*.

Finally, although two review papers (Benson 1994, Harner 1982) have concluded that evidence to date does not clearly indicate whether children talk about the past before the future, the future before the past, or whether both emerge simultaneously, our results suggest that children talk earlier about uncertainty with respect to present and future events/states than with respect to past ones. This finding is similar to that of Kuczaj & Daly (1978) who found that past hypotheticals, as

marked by more sophisticated modal terms such as *could* and *would*, emerged later than future hypotheticals. One explanation for this finding might be that children rarely encounter situations in which an adult is expressing uncertainty about a past event. However, another explanation might be that it is rare, even among adults, to express uncertainty about a past physical or psychological state. This may be due to a general understanding that events/states in the past are certain, simply by virtue of having already happened (i.e., the notion that one cannot change the past), unlike future events/states which are perceived of as inherently uncertain.

What might account for the developmental trends we have observed? Our discussion will be necessarily quite speculative, but may serve to highlight areas requiring further research with respect to children's developing expression and understanding of uncertainty.

In our data the earliest contexts in which children began, around the age of 2 years, to express uncertainty pertained to the present location, identity or physical attributes of objects or people, and their own intentions in the future. Interestingly, these former types of events in the physical world have been noted by other researchers to be among those first asked about by young children (Bloom, Merkin & Wootten 1982, Dunn 1988) at a similar age. For example, in the study by Bloom *et al.* (1982), children's earliest *Wh*-questions were of the form *where*, *what* and *who*, and emerged around 26 to 28 months of age. Perhaps such contexts are of universal interest to children in understanding the world around them. Moreover, the findings of recent infancy research suggest a keen interest on the part of infants in understanding the workings of the physical world that would appear to lay a solid foundation for children to contemplate alternative possibilities within these contexts by 2 to 2½ years of age. For example, many months before children are even capable of acting on the world themselves, they are actively considering possible and impossible states of affairs in the world and reasoning about the attributes and locations of objects (e.g., Baillargeon, 1994, in press). Such research has even shown that infants will generate hypotheses about alternative possible states of affairs in the world (Aguiar & Baillargeon 1999), although whether infants might hold different possibilites in mind with differing degrees of certainty is not yet known. Moreover, the use of modal terms to mark uncertainty with respect to intentions in the future, which was also observed to begin between 2 and 2½ years of age, may rest on an earlier ability, demonstrated in infants under 18 months of age: to understand certain human actions, such as grasping, as goal-directed; to relate distinct actions to overarching goals; and to interpret new

actions based on the context in which they occur (Woodward 1998, in press, Woodward & Somerville, in press).

In past research it has been claimed (for a review of such studies, see Shatz & Wilcox 1991) that children's first uses of modals do not express epistemic meanings, but deontic meanings centring on 'intention, volition, "imminence", and ability or, more often inability' (Shatz & Wilcox 1991: 331), and that children do not use modals in an epistemic sense until age three or four. However, from the results of our study we would suggest that it may not be the case that deontic meanings precede epistemic meanings. In our data, among the earliest modals to emerge during the third year of life were those used in contexts pertaining to the *present physical* and *future physical*, such as in the examples 'maybe down that street' and 'it might pop again'. We would argue that the meaning of the target modal terms in these contexts better fits current definitions of epistemic modality than deontic modality. For example, Choi (1991) has stressed that 'while epistemic modality has to do with the speaker's knowledge about the proposition, deontic modality expresses the condition of the agent toward the event in the proposition: ability, desire, obligation, etc.' (Choi 1991: 94). The use of modals to express epistemic meanings may have been overlooked (or underestimated) in previous studies of children learning English because the focus was on children's use of modal auxiliaries and the semi-modals *wanna, hafta, gonna, gotta* and *needta*, and these studies therefore did not include other early modal terms such as the modal adverbs *maybe* and *might* which may be the terms more likely to be used by children to first express epistemic meaning. Indeed, our finding that English-speaking children as young as two years of age may be able to use modals to express epistemic modality is not inconsistent with more recent findings investigating the expression of epistemic modality in languages other than English. For example, among children learning Korean, in which modality is expressed by sentence-ending suffixes, such suffixes have been found to be among the first inflectional morphemes to emerge in children's speech (Choi 1991). Moreover, children as young as age two will appropriately use the suffixes *-e* and *-ta* to distinguish between old/assimilated information and new/unassimilated information and the suffix *-tay* to mark an indirect source of information (Choi 1991). Choi (1991: 113) has argued that the use of the suffix *-tay*, in particular, 'seems to signal the beginning of a new phase in the development of epistemic modality such as the notion of inference and uncertainty of proposition'. We argue that findings such as ours and those of Choi (1991) demonstrate that some aspects of epistemic meaning are within the capability of

children younger than age three and that the goal of future work should be to define more clearly various meanings within this category, especially with respect to those first expressed by children as young as age two (for further discussion of such refinements as a result of cross-cultural linguistic studies of modality, see Choi 1991).

Similarly, the developmental course of epistemic meanings expressed by older children also needs to be charted more clearly. For example, in considering the use of epistemic modals in children four years of age and older, other authors have noted that modals can express a range of meanings that include, for example, judgements of one's own certainty or uncertainty of a proposition, the marking of an inference, an understanding of the inherent undecidability of a problem, or the hypo-thetical nature of a situation (e.g., Shatz & Wilcox 1991, Stephany 1986). However, our study has demonstrated that judgements of one's own uncertainty of a proposition may begin well before the age of four. In addition, our results suggest that some interesting developments in children's understanding of uncertainty after the age of three may have been overlooked in research to date. For instance, our results suggest a fairly marked increase in children's use of *might* after the age of 3;6 particularly in contexts classified as *future physical* and concerning 'things that might happen' of both a hypothetical and fantasy nature. Whether this represents some new cognitive milestone will have to await further research. However, we think this may be plausible given that in such contexts children showed a strong preference to use the term *might* that was not shown in other categories of use such as the *future intention* where, for example, the use of *maybe* was more common. Our finding, however, that children under the age of four rarely expressed uncertainty with respect to a belief or desire state, does concur with findings related to children's comprehension of the difference in meaning signalled by a speaker using different modal adjuncts to denote differing levels of uncertainty. For example, 4-year-old children, but not 3-year-old children, have been shown to understand the difference in meaning between a speaker using the term *probably* versus *possibly* (Byrnes & Duff 1989, Moore & Davidge 1989, Moore *et al.* 1990).

Indeed the finding that children tended to use the modal term *might* more often than other modal terms to talk about uncertainty in a *future physical* context raises a larger issue in need of further study. Namely, what distinctions in meaning are being conveyed (if any) through the use of different modal terms? Within the realm of epistemic modals, we know little about what systematic distinctions (i.e., contrasts in meaning, Clark 1987) are being made, even by adults, when using

modal terms such as *maybe, might* and *possibly,* or other avenues for indicating degrees of uncertainty such as the use of factive and non-factive verbs (*think* vs. *know*).

Finally, the possible role of parental input in influencing children's acquisition of epistemic modality is also another area requiring further study, especially with respect to modal adjunct terms which have not been studied in parental speech. One study (Shatz, Grimm, Wilcox & Niemeier-Wind 1990) has found that, among a group of children observed at age 2:5 and 2:9, only 10% of the modal auxiliaries used by the mother had an epistemic meaning. But the authors also noted that children picked up on meanings rarely used by the mothers, suggesting that the nature of the input alone cannot determine the course of acquisition.

Arriving at a full understanding of children's use of modal terms to express uncertainty may indeed require the consideration of concurrent developments in a number of possibly related domains, such as young children's understanding of the future, their ability to engage in pretence and other forms of hypothetical thinking, their growing understanding of the mind, and the development of the self. For example, might the fact that talk about future intentions was more likely to be about the self than others have to do with children's growing sense of an independent self? Despite the challenges that answering such questions may pose, we believe the task may be a very fruitful one, as these developments in children's understanding of uncertainty and the contexts in which it exists no doubt represent an important foundation for the later emergence of some of our most sophisticated and uniquely human cognitive enterprises, such as the recognition of alternative states of affairs and points of view, the scientific and philosophical contemplation of the certainty of our own knowledge, and the entertainment of creative and original hypotheses. In the words of one 4-year-old: 'Mommy, what might happen if doctors are sick?'

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