

Young children's understanding of the cognitive verb *forget**

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ABSTRACT

Investigation of children's understanding of the cognitive verb *forget* has shown that young children do not consider the role of prior knowledge when using this verb. Thus, someone may be said to have forgotten a fact despite not ever having previously known it. However, *forget* can also be used to refer to a failure to recall a prior intention. Three experiments examined the role of prior intention as well as prior knowledge in the comprehension of *forget* by 160 young children aged four to eight years. The results showed that children initially have two interpretations of *forget*: as an unfulfilled desire rather than a failure to recall a prior intention, and as a state of not knowing rather than a failure to recall prior knowledge. Explanations for the late comprehension of *forget* are discussed in terms of representation of knowledge and intention, processing capacity and exposure to pragmatic usages.

INTRODUCTION

The word *forget* is often described as a cognitive verb in that it can refer to the mental state or process of not remembering, as in a failure to recall some knowledge, e.g. 'I put my keys somewhere safe but I have forgotten where', or an intention, e.g. 'She meant to wash the car at the weekend but forgot.'

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However, usage of a cognitive verb does not necessarily reflect reference to a mental state. For instance, in sentences such as ‘Don’t forget to bring the tickets’ there is no direct reference to a mental state. Shatz, Wellman & Silber (1983) classify this type of usage as ‘action-memory’ in that the function of *forget* is to emphasize the phrase which follows. A further usage of *forget* is to denote an unintentional failure in performance. For instance, ‘I forgot my umbrella’ could mean ‘I intended to bring my umbrella but it slipped my mind’ in which case there is an (implicit) reference to the mental state of forgetting. However, it is also commonly used to denote a regrettable endstate, regardless of any prior intention, as in ‘Oh no, it’s raining and I’ve forgotten to bring my umbrella!’

The word *forget*, along with other cognitive verbs, can be used, therefore, to refer directly to a mental state or for conversational purposes. Hall & Nagy (1986) refer to this as a semantic–pragmatic distinction; the use of a cognitive word to refer to a mental state is conceptualized as SEMANTIC, as in the first two examples above, and as PRAGMATIC when a cognitive word is used for any other function, as in the last example.

Observational studies show that the ability to speak about mental states begins late in the second year and flourishes in the third (Bretherton & Beeghly, 1982; Shatz *et al.* 1983). Although most early references to mental states are either volitional (‘I want it’), perceptual (‘It hurts’) or physiological (‘I’m hungry’), cognitive verbs do appear at the same time, with *know*, *remember*, *forget* and *think* among the most frequently occurring. Despite the fuzziness of boundaries causing classification to be somewhat arbitrary, children’s first usage of cognitive verbs appears to be predominantly for conversational functions rather than mental state reference (Shatz *et al.* 1983). For instance, they are used for the purpose of modulating assertion (‘I think this is a dog’), as attentional devices (‘Guess what, Mummy?’) or, in the case of verbs of memory, to prompt or emphasize an action. Shatz *et al.* (1983) report a usage of *forget* as early as age 2;4 by their subject, Abe, who used it in the expression ‘Don’t forget mine home’ to urge his parents to bring along his toy house. Although this was not a reference to a mental state (it was coded as an *action-memory* usage), Shatz *et al.* record two mental state utterances using *forget* in the age range 2;6 to 2;8.

Experimental studies of children’s comprehension of cognitive verbs have examined children’s ability to select a verb to describe a person’s attitude towards a proposition. Typically, a hidden object task is used to manipulate a person’s knowledge about the location of an object. In this way it is possible to assess whether children consider this knowledge when distinguishing between such verbs as *know*, *guess* and *think*. Experimental evidence points to the age of four to five years as the time when children begin to differentiate between these cognitive verbs on the basis of knowledge states. Thus, Johnson & Maratsos (1977) showed that it was not until the age of four years

that children could indicate that the hider of an object knew where the object was, whereas the seeker may only think of where it may be. Similarly, Miscione, Marvin, O'Brien & Greenberg (1978) found that from 5;6 children considered the role of prior knowledge when choosing between *know* and *guess*. However, investigation of children's understanding of *forget* has suggested that the role of prior knowledge in this verb is not understood until later. Wellman & Johnson (1979) found that although children under five years could differentiate between *remember* and *forget*, their judgement was based on performance. In other words, successful performance was judged as 'remembering' and failure in performance as 'forgetting', regardless of the existence or otherwise of any prior knowledge. Even by the age of seven years, understanding of the role of prior knowledge was not well established. Although it appears later in development, this progression from performance-based to knowledge-based responding found for *remember* and *forget* reflects the pattern identified by Miscione *et al.* (1978) for *know* and *guess*. Here, too, *know* reflected successful performance whereas *guess* was associated with unsuccessful performance.

The late comprehension of cognitive verbs *vis-à-vis* other verbs is often explained in terms of acquisition of a theory of mind. Until the child has acquired the capacity to represent and reflect upon mental states, full understanding of cognitive verbs which denote these mental processes cannot be attained. As mentioned earlier, usage of *forget* to denote a mental state presumes the presence of prior knowledge or intention. In other words, one cannot forget something (be it an event, fact or task) or forget to do something, unless one has consciously seen, become aware of, learnt, or intended to do it, in the past. Actual present performance, assuming there was prior knowledge or intention, reflects one's state of mind: if performance is incorrect, one has forgotten, i.e. behaviour has been guided by one's mental state. To use these terms correctly, then, indicates a need for a theory of mind, i.e. the representational ability of reflecting on the prior and present knowledge/intentional state of oneself or another. As far as representation of knowledge is concerned, children from the age of four years generally have this ability (e.g. Perner, Leekam & Wimmer, 1987). There appears, therefore, to be a developmental lag between ability to represent beliefs and knowledge and understanding the role of prior knowledge when using *forget*.

Forget, therefore, appears to be a cognitively complex verb, with a variety of usages, which is in the child's lexicon from an early age and yet which children do not appear to understand fully for several years. As a cognitive verb, it involves either prior knowledge or prior intention as well as a 'failure to recall' component. The evidence of the age at which children understand the role of prior knowledge in *forget* is limited and conflicting; much less is known about the role of prior intention or the failure to recall component. The aim of the following studies was to investigate children's comprehension

of these various components. The first of the three studies compared comprehension of prior knowledge with prior intention in *forget*. The second study focused on children's understanding of *forget* in terms of a failure to recall. The third study combined the above studies as well as looking at children's ability to differentiate between desire and intention, both in terms of understanding intention and its role in *forget*.

EXPERIMENT 1

INTRODUCTION

The aim of the first experiment was to compare comprehension of the role of prior intention with the role of prior knowledge in *forget* in five- and seven-year-olds. Evidence that even at the age of seven years children do not fully understand the role of prior knowledge in *forget* comes from a study by Wellman & Johnson (1979). This study involved a story about a boy doll looking for his coat, which had been put by the child, either in or out of the doll's sight, into one of two cupboards. When the doll chose a cupboard, either incorrectly or correctly, the child was asked two questions (in counterbalanced order): 'Does the boy remember where his coat is?' and 'Does the boy forget where his coat is?' Thus, by manipulating outcome and prior knowledge in four different conditions, the child's understanding of these components of the two verbs, *remember* and *forget*, was assessed.

It is possible, however, that this study may not have succeeded in demonstrating the children's true competence. First, the question format may have misled children into responding incorrectly, in that it can be criticized for violating Grice's (1975) maxim of quantity. For instance, if the answer to the first question is 'yes', the second question becomes redundant. The only way the second question makes sense is if the answer to the first question is 'no'. Thus, the child may agree to the second question on the basis of his/her misinterpretation of the purpose of the second question. Siegal, Waters & Dinwiddy (1988) demonstrated that when children do not share the purpose underlying an experimenter's repeated or irrelevant questioning, they may switch their initially correct response to an incorrect one, possibly even when they are certain that their first response is the right one.

A second reason why Wellman & Johnson's results may not reflect children's real competence is that in the condition where there was no prior knowledge, the correct answer was 'no' to both questions. It is possible that children may expect to answer 'yes' to one question and 'no' to the other, not because they expect the questions to have different answers, but because they expect two different verbs to have contrasting meanings.

In order to overcome these possible confounding effects, the present study used a forced choice task, in which the child was presented with a story

involving two characters, only one of whom had a prior intention or knowledge. For both characters, the outcome was the same, i.e. failure in terms of finding an object or carrying out an action. The children were then asked to differentiate between the two characters on the basis of who had forgotten. In contrast to Wellman & Johnson who used the present tense ('Does the boy forget ...?'), the test question was phrased in the past tense ('Who had forgotten ...?') on the basis that this seemed more natural.

If, as Wellman & Johnson suggest, young children base their response on the outcome, they should respond 'both' to a question regarding who had forgotten, since both characters will have failed. This performance-based account of young children's understanding of *forget* would also predict no significant difference in their comprehension of the roles of prior knowledge and prior intention.

METHOD

Subjects

A total of 40 white children from two local primary schools were tested. Both schools were in semi-rural catchment areas with children from a range of socio-economic backgrounds. The children were divided into the following age groups: Reception year ($N = 20$) mean age 5;4 (range 4;9–5;9) and Year 2 ($N = 20$) mean age 7;6 (range 7;2–7;10). Within each year group, gender and school composition were equally divided.

Materials

The experiment used five doll characters (two representing boys, one of whom carried a bag; two representing girls and one representing a mother) and a doll's coat. A cassette recorder was used to audio-record the experiment.

Procedure

Permission to interview the children was gained from the parents of all the children. The younger children had become acquainted with the experimenter during a previous visit to their class. For the experiment each child was seen individually in a quiet room in their school and presented with two stories which were acted out with toys. The order of presentation of the stories was counterbalanced across subjects. Each story involved two characters, one of whom had either a prior intention or prior knowledge. For instance, the prior knowledge story was as follows: *Lucy and Peter were playing in the garden. Mummy came out and said she had an apple for each of them. Lucy said 'I don't want to eat my apple now.' So she took her apple and put it under her coat to eat later. Peter said 'I don't want to eat my apple yet either. Will you look after it for me, Mum?' So Mummy took Peter's apple indoors and put it somewhere safe. He didn't see where she put it.* The children

were asked three control questions to test their memory and comprehension of the events of the story (*Who was playing in the garden? Who put an apple under their coat? Who asked Mummy to look after their apple?*) The questions were designed to allow the child the opportunity to identify each character, as well as respond 'both', in an attempt to overcome response set. The experimenter confirmed that the answers to the questions might be one character, the other character or even both of the characters. If a child was hesitant or answered incorrectly, the story was repeated and the control questions asked again. For none of the questions were children required to remember the names of the characters: pointing at the dolls or saying 'the boy/girl' was sufficient. Both stories were then continued with all the characters failing to carry out a particular action. Three more control questions were asked to check children's memory of the characters' prior mental states and the outcome (*Who will say 'I put my apple somewhere. Where was it?' Who will say 'I didn't see where Mummy put my apple?' Did anybody find their apple in the kitchen?*) before the test questions concerning which character had forgotten were asked (*Who had forgotten where their apple was? Had (the other character) forgotten where his/her apple was?*). See Appendix 1 for full stories and questions.

RESULTS

All 40 children answered the six control questions in each story correctly, with only one five-year-old needing the story to be repeated. Responses to the test questions 'Who had forgotten ... ?' and 'Had the other character also forgotten?' were coded as follows: Category 1 – initial identification of the correct character and then confirmation that the other character had not forgotten; Category 2 – initial identification of the correct character and then affirmation that the other character had also forgotten; Category 3 – both characters identified as having forgotten in response to the first question and Category 4 – any other combinations of responses to both questions.

Statistical analysis of the distribution of responses across categories according to the order in which the conditions were presented revealed that in the prior knowledge condition the five-year-olds' responses may have been influenced by the order in which they received the two stories ($\chi^2 = 8.00$, d.f. = 3, $p = 0.046$). Although no order effects were found in the other condition or with the older children, it was decided to use only the first response from each child, thus confining all further analyses to between-subject comparisons.

As can be seen from Table 1, the distribution of responses varied according to age and condition. In the prior intention condition all the children in both age groups gave Category 1 answers, i.e. they identified the correct character as having forgotten and stated, correctly, that the other character had not forgotten. However, in the prior knowledge condition, although the majority

COMPREHENSION OF *FORGET*

TABLE 1. *Number of responses in each category by age and condition*

Age	Condition	Category			
		1 both questions* right	2 2nd question wrong	3 'both' response to 1st question	4 1st question wrong
5	Intention	10	0	0	0
5	Knowledge	0	6	2	2
7	Intention	10	0	0	0
7	Knowledge	6	0	3	1

* Question 1: 'Who had forgotten ...?', Question 2: 'Had the other character also forgotten?'

of seven-year-olds gave Category 1 responses, the modal response for the younger age group was Category 2, with no five-year-old giving a Category 1 response. Statistical comparisons of the two conditions within each age group showed a significant difference for the younger children ($\chi^2 = 20.00$, d.f. = 3, $p < 0.001$) but not the older children ($\chi^2 = 5.00$, d.f. = 3, $p = 0.082$).

Comparison of the two age groups within each condition showed there to be no difference in the prior intention condition (all children gave Category 1 responses). However, there was a significant difference in responding in the prior knowledge condition ($\chi^2 = 12.533$, d.f. = 3, $p = 0.006$). The younger children were more likely to give a Category 2 response, whereas the majority of older children gave a Category 1 response as in the prior intention condition.

DISCUSSION

In the knowledge condition, 60% of the seven-year-olds identified the correct character as having forgotten and the other character as not having forgotten. This increase over the 30% of children who were able to differentiate on the basis of prior knowledge in Wellman & Johnson's study may reflect the fact that the seven-year-olds' developing awareness of the role of prior knowledge was masked in the latter study by the question format. The majority of the five-year-olds in the present study did not focus on the outcome, as found by Wellman & Johnson: instead, the modal response was to identify the correct character initially but then to agree that the other character had also forgotten. This suggests that these children were beginning to appreciate the role of prior knowledge. It is possible that the younger children's affirmative response to the question of whether the other character had also forgotten may have been due to a desire to agree with the experimenter. If only the response to the first question is considered, there

is no difference between the five- and seven-year-olds. In the intention condition, all the children in both age groups were unable to identify correctly the character who had forgotten.

Thus, it would appear that young children do not define *forget* solely in terms of failed outcome, at least as far as prior intention is concerned. Although neither character attained the outcome of buying chocolate, even the younger children were able to identify the character who had a desire/intention to buy chocolate as the one who had forgotten. However, it cannot be ascertained from this experiment whether they were using *forget* to refer to a failure to recall a desire or an intention or merely to refer to an unfulfilled desire/intention, regardless of the reason why. The task could have been completed successfully just by matching desire/intention with outcome, a strategy which young children have been shown to employ in other contexts. For instance, Shultz, Wells & Sarda (1980) investigated young children's ability to differentiate between intended and accidental outcomes. They asked children to cross their hands and then interlace their fingers. The children then had to stretch out the finger indicated by the experimenter, a task which led to many action errors. When asked if they meant to move that finger or not, three-year-olds performed as accurately as seven-year-olds in identifying the correct finger movements as intended and the errors as not intended. However, in another task, Astington (1990) found that children below the age of four years, when asked to identify which character *meant* to get wet, were unable to differentiate between the boy who accidentally gets wet by falling into the water and another who jumps into the water. These seemingly discrepant findings are reconciled by Perner (1991) who proposes that as the Astington task does not explicitly state the goal/desire of the protagonist, it requires metarepresentation of intention in order to decide whether an action was deliberate or not. The Shultz *et al.* task, on the other hand, where the desire is explicitly stated, can be completed successfully by simply matching the desired outcome with the actual outcome: if the finger indicated by the experimenter (the desired outcome) corresponded with the finger which the child stretched out (the actual outcome) then the action was judged as intended. However, if another finger was moved, then there was a mismatch between the two outcomes and the movement was judged as accidental. Applying a similar strategy to the present experiment, the child could have identified which character had forgotten merely by comparing the desired end goal of each character with the actual goal, i.e. if the character's desire was to buy chocolates and he returned with no chocolates, then he had forgotten, whereas the character who had no desired goal of chocolates and returned empty-handed had not forgotten. Experiment 2 was therefore designed to investigate the basis on which children were making their judgements.

EXPERIMENT 2

INTRODUCTION

The aim of this experiment was to examine whether children understand *forget* in terms of failing to recall an intention or simply as an unfulfilled desire/intention. To achieve this, Experiment 2 tested young children's ability in a task which could not be performed successfully using a matching strategy and which would tap their understanding of the 'failure to recall' component of *forget*. The experiment involved presenting children with four stories, each involving two characters with the same desire/intention and the same outcome. The only difference between the two characters was the cause of the outcome. In one instance, the character forgot to carry out his/her intention; in the second, the character was prevented from carrying it out. In neither case was the desire fulfilled.

In order to identify which character had forgotten to carry out the intention, the reason behind the unfulfilled desire/intention needed to be taken into account. Use of a matching strategy between desire and outcome would not differentiate between the two characters as these were the same for both. Thus, if children defined *forget* solely in terms of an unfulfilled desire/intention, they would identify both characters as having forgotten.

METHOD

Subjects

A total of 48 white children from two local primary schools were tested. Both schools were in semi-rural catchment areas with children from a range of socio-economic backgrounds. The children were divided into the following age groups: Reception year ($N = 24$) mean age 4;9 (range 4;3–5;2) and Year 2 ($N = 24$) mean age 6;10 (range 6;5–7;2). The mean ages for the two year groups were lower than those of the respective year groups in the previous experiment because the data were collected at a different time in the academic year. Within each age group, gender and school composition were equally divided. None of the children had taken part in the previous experiment.

Materials

The experiment used four stories, each illustrated by six coloured line drawings mounted on separate cards. An example of one of the stories is given in Appendix 2. Each story involved two characters, a girl and a boy, one of whom forgot to carry out a prior intention while the other was prevented from carrying out the prior intention. In two stories, the character who forgot was the girl; in the other two stories the boy forgot. A cassette recorder was used to audio-record the experiment.

Procedure

Each child was seen individually in a familiar room at their school. Each story was presented in turn to the child with the pictures laid out in two rows (each depicting one character) in front of the child, where they remained while the questions were asked. The order of presentation of stories was counter-balanced. Four control questions were asked after each story to check the child's memory of the events of the story as well as comprehension of the intentions of the characters. The correct answers to these questions required the child to identify, either by name or by pointing, each character separately, both the characters or neither of the characters. If a child answered incorrectly, the story and questions were repeated.

RESULTS

Although all 48 children eventually answered the four control questions in each story correctly, it was necessary to repeat stories to more than half of each age group, with 14 of the younger and 13 of the older children needing repetition of at least one story. No child required more than one repetition of a story. The responses to the two test questions were coded using the same categories as Experiment 1. Since each child was presented with four stories, his/her scores summed to four across categories.

TABLE 2. *Mean number of responses in each category by age group*

Age	Category			
	1 both questions* right	2 2nd question wrong	3 'both' response to 1st question	4 1st question wrong
4	0.38	0.46	2.33	0.83
6	1.58	0.25	1.71	0.46

* Question 1: 'Who forgot to ...?', Question 2: 'Did the other character forget?'

As can be seen from Table 2, the response patterns of the two age groups differ. For both age groups the modal response was Category 3 (the response of 'both' to 'Who forgot to ...?'). However, of those children who did not give a Category 3 response, the majority of older children gave a Category 1 (correct) response, whereas the responses of the younger children were more evenly distributed amongst the other three categories. This was confirmed by an age \times category analysis. For each child, the sum of the four category scores was constrained to four, so a within-subjects ANOVA was inappropriate, and therefore a MANOVA solution was obtained. The main effect of category was significant ($F(3, 44) = 12.43$; $p < 0.001$). More importantly, the

age \times category interaction was also significant ($F(3, 44) = 3.54$; $p = 0.022$), indicating that the profile of response frequencies across the four categories differed between the two ages. The age comparison for Category 1 was significant ($t(46) = 3.226$; $p = 0.002$) but not for any of the other three categories ($p > 0.14$).

DISCUSSION

Even by the age of seven years comprehension of the 'failure to recall' component was not well-established (only 25% of six- to seven-year-olds responded correctly on all four trials). However, although for both age groups the modal response was that both characters had forgotten, significantly more six- to seven-year-olds chose the correct character than did the four- to five-year-olds, suggesting that understanding of the 'failure to recall' component develops with age.

In the domain of intention, the results of Experiments 1 and 2 taken together suggest that children at first define *forget* in terms of an unfulfilled desire/intention. This is indicated by all the children identifying the correct character in Experiment 1, where only one character had an unfulfilled desire/intention, and by the majority of children incorrectly identifying both characters as having forgotten in Experiment 2 where both characters failed to achieve their initial desire/intention.

However, it is not clear from Experiments 1 and 2 whether the children's failure in these tasks was due to either or both of the 'prior intention' and 'failure to recall' components not being incorporated into their representation of the lexical item *forget* or due to the inability to represent intention. As discussed earlier, although all the children in Experiment 1 identified the correct character as the one who had forgotten, they may have differentiated the characters on the basis of an unfulfilled desire or an unfulfilled intention as for both characters desire and intention were concordant. Similarly, in Experiment 2 both characters had the same desires and intentions. It was not possible, therefore, to know whether the children in either experiment were basing their response on the desire or on the intention of the character. As *forget* is concerned with a failure to recall an intention and not a desire, it is important to know whether young children recognise this distinction and also to know the reason behind any failure in comprehension.

Certainly as far as prior knowledge in *forget* is concerned, the misuse of *forget* cannot be accounted for solely in terms of inability to represent knowledge as this capacity is well established by the age of four years and yet even at the age of seven years many children seem not to have incorporated this component into their definition of *forget*. Therefore, a third experiment was carried out to investigate the relationship between the ability to represent intention and comprehension of the various components of *forget*.

EXPERIMENT 3

INTRODUCTION

The aim of this experiment was to compare the development of comprehension of (a) intention, (b) the role of prior intention in *forget*, (c) the 'failure to recall' component of *forget* and (d) the role of prior knowledge in *forget*.

In order to assess comprehension of intention, a task based on a design developed by Phillips (1993) was used. In this task, two characters have the same desire which is fulfilled. However, only one character had the intention to carry out the desire (for the other character the desire came about fortuitously). Children were asked to identify who had been 'trying to' achieve the outcome. By separating desire from intention and, by holding desire constant and manipulating intention, it precludes the use of a matching strategy for arriving at the correct response. Successful completion of the task requires, therefore, comprehension of intention in terms of a representation of a means to a desired goal.

Comprehension of the role of prior intention in *forget* was assessed by replacing a successful outcome in the first task with an unsuccessful one and asking children which character had forgotten. Successful completion of this task requires comprehension of *forget* in terms of a failure to recall an intention rather than failure to recall a desire.

Performance in these tasks was also compared with performance in two other conditions, one being a replication of Experiment 2 which measured comprehension of the 'failure to recall' component, and the other a task to measure comprehension of the role of prior knowledge in *forget*.

METHOD

Subjects

A total of 72 white children from a local primary school were tested. The school was in a semi-rural catchment area with children from a range of socio-economic backgrounds. The children were divided into the following age groups, with gender equally divided between the two: Year 1 ($N = 24$) mean age 5;11 (range 5;6–6;5), Year 2 ($N = 24$) mean age 6;11 (range 6;8–7;5) and Year 3 ($N = 24$) mean age 7;11 (range 7;6–8;5). None of the children had taken part in the previous experiments.

Design

The experiment was a mixed design with age (three age groups) as a between-subjects variable and type of task as a within-subjects variable. There were four different tasks, each with four stories:

Task A was designed to tap the child's understanding of intention. Desire and outcome were both successful and held constant while intention was manipulated.

Task B was designed to measure understanding of the role of prior intention in *forget*. Again desire and outcome were held constant, although this time the outcome was unsuccessful, and intention was manipulated.

Task C measured understanding of the cause behind the unfulfilled desire/intention. Desire, intention and the outcome (unsuccessful) were held constant and the cause behind the outcome manipulated.

Task D measured understanding of the role of prior knowledge in *forget*.

Materials

The experiment used 16 stories, four for each condition, with each story depicted by six or eight coloured line drawings mounted on separate cards. (See Appendix 3 for a story example from each condition.) A cassette recorder was used to audio-record the experiment.

Procedure

Each child was seen on two separate occasions, a few days apart, and was presented with two tasks on each occasion, tasks A and C on one day and tasks B and D on another day. The order of presentation of the two sets of tasks was counterbalanced, as was the presentation of task within each set. The stories were presented and scored in a similar manner to Experiment 2.

RESULTS

From Table 3 it can be seen that the modal response for Tasks A, B and C moved with age from Category 3, a response of 'both', to Category 1, the correct response. In Tasks B and C, the move takes place in the oldest age group, whereas for Task A the move takes place earlier, in children a year younger. In Task D, the modal response was the correct response of all three age groups, although the youngest age group gave approximately one third fewer correct answers than the other two age groups. In each task the number of correct responses was least for the youngest age group.

The data fell into an age \times order \times task \times response category design, the first two factors being between-subjects, and the last two factors within-subjects. For each subject in each task, the frequencies of the three response categories sum to four since there were four trials per task so a number of main effects and interactions are necessarily zero. Moreover, the constant sum property of the data means that it was inappropriate to use a within-subjects ANOVA. Therefore a MANOVA solution was computed.

TABLE 3. Mean number of category responses for each task by age group

Age	Task					
	A: Intention			B: Prior intention in <i>forget</i>		
	Cat. 1 right	Cat. 2. wrong	Cat. 3 'both'	Cat. 1 right	Cat. 2 wrong	Cat. 3 'both'
6	1.49	0.79	1.75	1.5	0.5	2.0
7	2.49	0.49	1.08	1.75	0.29	1.99
8	2.13	0.71	1.17	2.21	0.25	1.54

Age	Task					
	C: Failure to recall intention in <i>forget</i>			D: Prior knowledge in <i>forget</i>		
	Cat. 1 right	Cat. 2 wrong	Cat. 3 'both'	Cat. 1 right	Cat. 2 wrong	Cat. 3 'both'
6	1.0	0.54	2.46	1.79	0.7	1.5
7	1.58	0.29	2.13	2.91	0.29	0.79
8	2.33	0.21	1.46	2.54	0.29	1.17

Modal response for each task in bold, max score = 4.

None of the effects involving the order factor were significant. Aside from the uninteresting main effect of category, the only significant effects were two two-factor interactions. The age \times category interaction ($F(4, 94) = 4.311$, $p = 0.003$) confirmed the impression from Table 3 that the balance between correct responses and the other two response categories changed with age. The category \times task interaction ($F(6, 43) = 3.827$) indicates that the balance between the response categories also varies according to task. The age \times task \times category interaction was not significant ($F(12, 86) = 0.737$). Thus, there is no statistical support for the impression from Table 3 that Task D (comprehension of prior knowledge in *forget*) is different from the other three tasks in the way that the balance between correct and other responses changes with age.

These findings were followed up by separate age \times order \times task ANOVAs on each response category. For correct responses, the main effect of age was significant ($F(2, 48) = 7.362$, $p = 0.002$), as was the main effect of task ($F(3, 144) = 5.599$, $p = 0.001$). The age effect was describable as a linear trend ($F(1, 48) = 12.603$, $p < 0.001$). The non-linearity component was not significant. Tukey tests on the main effect means for task revealed a significant difference between Tasks C (failure to recall an intention) and D (prior knowledge) ($p = 0.001$).

For responses in the 'both' category, there were again main effects of age ($F(2, 48) = 3.275, p = 0.046$) and task ($F(3, 144) = 2.848, p = 0.040$). The linear trend for age was significant ($F(1, 48) = 5.380, p = 0.025$) but the non-linearity component was not. Tukey tests on the main effect means for task revealed significant differences between Tasks A (intention) and C (failure to recall intention), B (intention in *forget*) and D (prior knowledge in *forget*), and C and D ($p < 0.001$ in each case).

For responses in Category 2 (all other incorrect responses), the main effect of age was not significant ($F(2, 48) = 2.786, p = 0.072$) though the linear trend was ($F(1, 48) = 5.053, p = 0.029$). The non-linearity component was not significant. The main effect of task was significant ($F(3, 144) = 8.006, p < 0.001$). Tukey tests on the main effect means for task revealed marginally significant differences between Tasks A (comprehension of intention) and B (comprehension of intention in *forget*) and between Tasks A and C (failure to recall intention) ($p = 0.056$ in each case).

DISCUSSION

Performance in each of the four tasks reflected the same developmental pattern of moving from responding 'both' to identifying the correct character, suggesting that children were moving from having definitions based on desire or outcome to definitions which incorporated intention or knowledge.

Although the response of 'both' in each task could have been based on outcome, which was held constant, the results of the first experiment, where children could differentiate between characters with the same outcome, suggest that their responses in the tasks involving intention are more likely based on initial desire. Thus, in the task measuring comprehension of intention (Task A), 'trying to' seems to have been interpreted as 'wanting to' by the six-year-olds but in terms of 'intending to' by the seven- and eight-year-olds. Similarly, when prior intention was manipulated (Task B) and children were asked to identify the character who had forgotten, the younger children responded in terms of whose desire had not been fulfilled (i.e. both characters) rather than whose intention had not been fulfilled. Identifying both characters as having forgotten in the task manipulating the 'failure to recall' component (Task C) suggests an initial definition of *forget* based simply on unfulfilled desires or intentions but without the requirement of a recall failure. Younger children also identified both characters as having forgotten in the condition manipulating prior knowledge (Task D). Although it is possible that these children were again using a desire-based definition for *forget*, in that the desire to tell someone some information was not fulfilled, it is more likely that *forget* was being used to convey 'not knowing'.

The prior knowledge component of *forget* was understood better than the 'failure to recall an intention' component, with understanding of this latter component developing concurrently with understanding of the previous

intention component. No developmental lag was found between comprehension of intention and the role of prior intention in *forget*.

GENERAL DISCUSSION

The results of these experiments confirm the findings of Wellman & Johnson that young children do not comprehend the role of prior knowledge in the verb *forget* and that this comprehension develops with age. By the age of eight years, most children in this study showed some understanding of the role of prior knowledge in forgetting. This was a substantially higher level of correct performance than that found by Wellman & Johnson, a finding which may be due to methodological problems with the latter study which led to an underestimation of children's competence. Younger children who did not consider the role of prior knowledge appeared to define *forget* in terms of not knowing.

Comprehension of the role of prior intention followed a similar developmental progression with seven-year-olds performing significantly better than five-year-olds. The role of prior intention was not as well understood as the role of prior knowledge. However, contrary to Wellman & Johnson's proposal, young children do not appear to base *forget* solely on outcome but to define it instead in terms of an unfulfilled desire. Experiment 1 showed that even the younger of the two groups of children could identify which character had forgotten to carry out a particular action when only one of the characters had had the initial desire to do so. However, what these children failed to understand is that apart from requiring an initial desire/intention, forgetting also involves a failure to recall. Comprehension of this component followed the same pattern as that of comprehension of the role of prior intention.

It would appear, therefore, that young children have little or no understanding of *forget* in terms of failing to recall an earlier intention or knowledge. Why is this? First, given that *forget* appears to be defined in terms of an unfulfilled desire, it could be that comprehension reflects the child's level of metarepresentational ability, with older children able to represent knowledge and intention and younger children operating with a 'desire psychology'. This is supported by the same response pattern found in the task measuring comprehension of intention in Experiment 3. However, this does not explain why children are late in understanding the role of prior knowledge in *forget* when the ability to represent knowledge is apparent from the age of four years. A previous study by the authors (Hill, Collis & Lewis, in press) comparing ability in a false belief task and comprehension of the role of prior knowledge in *forget* demonstrated that young children's failure to consider this component was not the result of difficulties in representing knowledge.

Second, comprehension of *forget* can also be viewed within the framework

of Graham & Weiner's (1986) attribution–emotion model. Despite having a good understanding of the types of situations which evoke emotions, young children do not appreciate the relevant causal attributions which elicit such feelings (Thompson, 1989). One explanation put forward is that inference of some emotions, such as pride or guilt, is cognitively more complex than emotional reactions such as happiness or sadness, which are purely outcome-dependent and require only a 'primary appraisal' of the situation. Attribution-dependent emotions, such as guilt, however, require a 'secondary appraisal' which involves consideration of the causes of the situation. Although not an emotion term, *forget* could be seen as equivalent to attribution-dependent emotions in that it requires consideration not only of the outcome but of the causes underlying the outcome. This explanation may account for children's failure to consider the role of prior knowledge, where their response may well be based purely on outcome, but at first sight does not appear to account for the findings of Experiment 1 in which children's responses were based on initial desires and not on the outcome. However, as desire is easily understood by even very young children, this component may be accessible through a primary appraisal.

A similar account of comprehension is that young children do appreciate the roles of prior knowledge and intention but only when they are the most salient feature. Using Gelman, Meck & Merkin's (1986) phraseology, young children may have the conceptual-competence but lack the utilisation-competence, i.e. lack the ability to attend to the right features in a situation. Mental states cannot be directly observed but have to be inferred. Thus, if we see someone look into a box, we infer from this that they *know* what is in the box. Having inferred their knowledge state, if the contents of the box are secretly changed, we infer that the person will now have a false belief. We infer that someone is *guessing* what is in a box if we believe that they do not know, irrespective of their actual performance. In order to infer that someone has *forgotten*, however, we have to consider not only their prior knowledge or intentional state but also their present behaviour. This need to consider present behaviour, which is perceptually salient, may distract young children from the other less salient components of prior knowledge/intention and 'failure to recall' and may explain why comprehension of *forget* comes later than comprehension of other mental state terms such as *know* and *guess*.

Some support for this explanation comes from studies which have attempted to increase the salience of prior knowledge. Johnson & Wellman (1980) presented children with a hidden object task which included a trick condition in which their directly experienced mental state contrasted with their performance. Thus, although the children knew where an object had been hidden, when choosing a search location they appeared to have failed (due to a trick drawer). However, instead of focusing on their perceived failure, the children did report their mental state.

An alternative explanation of young children's difficulty with the tasks reported above may lie in children's comprehension of the events of the stories. For instance, in the prior intention story in Experiment 2, it is possible that children may have inferred that Tom, on discovering he had lost his money, had returned home to fetch some more. Thus, when responding that Tom as well as Sarah had forgotten to buy apples, the child was referring to the fact that Tom had not returned to the shops to buy apples as he had failed to recall his original intention. Mental states of others always have to be inferred from behaviour and our knowledge of their prior mental states. It is possible that children were able to make these inferences but were basing them on a different interpretation of the events of the story.

Finally, it may be that children's exposure to usages of *forget* are largely in pragmatic situations where there is no reference to mental state or in contexts where any reference to prior knowledge or intention is implicit and not readily available to the child attempting to interpret the word. As illustrated at the beginning of this paper, *forget* can be used pragmatically to denote a failure in performance, e.g. 'I forgot my umbrella', where there was no prior intention to bring the umbrella. It can also be used in such a way that the prior intention is not explicitly stated, e.g. 'I (meant but) forgot to buy the newspaper at the shops'. In both cases, the outcome (of bringing an umbrella or buying a newspaper) is desired but not achieved. Thus children come to interpret *forget* in terms of an unfulfilled desire and fail to understand that it can also be used to refer to the mental state of failing to recall. In the context of forgetting knowledge, *forget* is not used pragmatically, i.e. use of the word *forget* when referring to knowledge always implies that this knowledge was previously known. However, this prior knowledge component is often implicit and not, therefore, available to the child. Without this component, *forget* becomes equated with *not knowing*.

Thus, exposure to a majority of pragmatic usages and/or usages with implicit reference to prior knowledge or intention may result in the child initially interpreting *forget* in terms of not knowing or not fulfilling a desire. From these two separate definitions, full understanding of the implications of prior knowledge and prior intention and the failure to recall component eventually develop, though not necessarily concurrently. The results of these experiments support this account, in that young children appeared to define *forget* in terms of an unfulfilled desire or in terms of not knowing, and with understanding of prior knowledge developing before understanding of prior intention.

As well as conceptual factors, young children's understanding of cognitive verbs may also be influenced by linguistic factors. Like other cognitive verbs, *forget* can take various complements, e.g. sentential ('I forgot her car was blue'), wh- ('She forgot where the apple was') and infinitive ('Who forgot to buy some apples?'). It is quite possible that these syntactic differences may

affect comprehension directly or interact with conceptual factors. Investigation of linguistic factors was beyond the scope of this research. However, the complements used with *forget* in the studies reported here were controlled, with infinitive complements being used with forgetting of intention and wh-complements used with forgetting of knowledge. Both of these types of complement are known to be in the repertoire of children from the beginning of their third year (Bloom, Rispoli, Gartner & Hafitz, 1989). The finding that the prior intention component of *forget* was not understood as well as the prior knowledge component may be related to the type of complement.

APPENDIX 1

EXPERIMENT 1: PRIOR KNOWLEDGE STORY

Lucy and Peter were playing in the garden. Mummy came out and said she had an apple for each of them. Lucy said 'I don't want to eat my apple now.' So she took her apple and put it under her coat to eat later. Peter said 'I don't want to eat my apple yet either. Will you look after it for me, Mum?' So Mummy took Peter's apple indoors and put it somewhere safe. He didn't see where she put it.

Control questions

- (1) Who was playing in the garden?
- (2) Who put an apple under their coat?
- (3) Who asked Mummy to look after their apple?

That's right. Sometimes the answer is Lucy, sometimes it's Peter and sometimes it's both of them. When Lucy and Peter had finished their game, they decided to eat their apples. They went into the kitchen to get the apples but they couldn't find them.

Control questions

- (4) Who will say 'I put my apple somewhere. Where was it?'
- (5) Who will say 'I didn't see where Mummy put my apple?'
- (6) Did anybody find their apple in the kitchen?

Test questions

- (7) Who had forgotten where their apple was?
- (8) Had (the other character) forgotten where his/her apple was?

EXPERIMENT 1: PRIOR INTENTION STORY

One day Tom decided to go to the town to buy some chocolates for his mummy. He took his money and a bag to put the chocolates in. On the way he saw his friend Mary. Mary said 'I'm going to town as well but I'm going

to the library.’ So they both walked together to town and they both went into the library and looked at the books.

Control questions

- (1) Who went to town to buy chocolates for Mummy?
- (2) Who went to town to go to the library?
- (3) Who went into the library and looked at the books?

That’s right. Sometimes the answer is Tom, sometimes it is Mary and sometimes it is both of them. After the children had looked at the books, they walked home together. Nobody bought anything at the shops.

Control questions

- (4) Who will say ‘I meant to buy something at the shops. What was it?’
- (5) Who will say ‘I meant to go to the library’?
- (6) Did anybody buy any chocolates?

Test questions

- (7) Who had forgotten to buy some chocolates?
- (8) Had (the other character) forgotten to buy chocolates?

APPENDIX 2

EXPERIMENT 2: EXAMPLE OF STORY

‘One day Tom’s Mum asks Tom to go the shops and buy some apples. She gives him some money and a basket. Sarah’s Mum also wants some apples and she gives Sarah some money and a basket and asks her to buy some apples as well. They both go to the shops. When Tom gets to the shops he finds that he has lost his money. So he goes home. When Sarah gets to the shops she sees the library and goes in and reads some books. And then she goes home.’ The experimenter then asked the child four control questions, explaining to the child that the answers to the questions may be either character, both or neither or them.

Control questions

- (1) ‘Who went to the shops to buy some apples?’
- (2) ‘Who lost their money?’
- (3) ‘Who went to the library and read books?’
- (4) ‘Who bought some apples?’

Test questions

- (5) ‘Who forgot to buy some apples?’
- (6) ‘Did (other character) forget?’

APPENDIX 3

EXPERIMENT 3: EXAMPLE OF TASK A STORY

This is Andrew. Andrew has lost his football and wants to find it. But his Dad says 'No, you must help me rake up the leaves in the garden.' Andrew goes to the garden to help his Dad rake up the leaves. Look! He finds his football!

This is Sam. Sam has lost his football and wants to find it. His Dad says 'Yes, you can go and look for your football.' Sam goes into the garden to look for his football. Look! He finds his football!

Control questions

- (1) Who wanted his football?
- (2) Who went into the garden to find his football?
- (3) Who went into the garden to help rake up the leaves?
- (4) Who found his football?

Test question

- (5) When he went out to the garden, who was trying to find a football?

EXPERIMENT 3: EXAMPLE OF TASK B STORY

Here is Tom. Tom has eaten all his sweets and he wants some more. He goes to the shops to buy some more sweets. When he gets to the shops, he goes into the toy shop and looks at the toys. Then he goes home again.

Here is Luke. Luke has eaten all his sweets and he wants some more. But it is his Mum's birthday so he goes to the shops to buy her some flowers. When he gets to the shops, he goes into the toy shop and looks at the toys. Then he goes home again.

Control questions

- (1) Who wanted some sweets?
- (2) Who went to the shops to buy some flowers for his Mum?
- (3) Who went to the shops to buy some sweets?
- (4) Who bought some sweets?

Test question

- (5) Who forgot to buy some sweets?

EXPERIMENT 3: EXAMPLE OF TASK C STORY

This is Katie. Katie has just come back from holiday and has a stick of rock for her friend.

Katie goes to her friend's house to give her the rock.

When Katie gets to her friend's house, she plays with her friend's new puppy. Then Katie goes home again.

This is Matthew. Matthew has just come back from holiday and has a stick of rock for his friend. Matthew goes to his friend's house to give him the rock. When Matthew gets to his friend's house, there is no-one in. Then Matthew goes home again.

Comprehension/memory questions

- (1) Who went to their friend's house to give them some rock?
- (2) Who played with her friend's puppy?
- (3) Whose friend wasn't in?
- (4) Who gave their rock to their friend?

Test question

- (5) Who forgot to give their rock to their friend?

EXPERIMENT 3: EXAMPLE OF TASK D STORY

Nicky's friend has got some new baby rabbits. When Nicky goes to look at the rabbits, they are asleep in the hutch and she can't see them. When Nicky gets home, Mum says 'How many baby rabbits has your friend got?' Nicky says 'I don't know'.

Janet is also going to see the new baby rabbits. When Janet goes to look at the rabbits they are hopping about in the run and she can see them, a white one, a brown one and a black one. When Janet gets home, Mum says 'How many baby rabbits has your friend got?' Janet says 'I don't know'.

Control questions

- (1) Who went to see some baby rabbits?
- (2) Who saw the baby rabbits in the run?
- (3) Who couldn't see the rabbits because they were asleep?
- (4) Who told Mum how many rabbits there were?

Test question

- (5) Who had forgotten how many rabbits there were?

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