British Journal of Developmental Psychology (1987), **5**, 125–137 *Printed in Great Britain*

Three-year-olds' difficulty with false belief: The case for a conceptual deficit

Josef Perner, Susan R. Leekam and **Heinz Wimmer**

The hypothesis, that a conceptual limitation underlies 3-year-olds' difficulty with false-belief attribution (Wimmer & Perner, 1983), was tested against three competing hypotheses. These were: (1) failure to retain essential facts, (2) failure to understand the normal expectations which give rise to false belief and (3) pragmatic misinterpretation of the test question. Results showed that false-belief attribution remained difficult for younger 3-year-olds despite their retention of essential facts and despite attempts to make expectations more explicit and prevent pragmatic misinterpretation. These findings strengthen the original hypothesis, specified here as the inability to assign conflicting truth values to propositions. This hypothesis can explain why 3-year-olds find pretend play, the distinction between expected and achieved outcomes, the real–imaginary distinction and level 1 perspective taking easier to understand than false belief, the reality–appearance distinction and level 2 perspective taking.

The ability to attribute a false belief to another person is an important requirement for understanding social interactions of moral significance, like deception, mistakes, lying, joking, etc. It is also of interest to the cognitive theorist because it calls for representation of alternative world models (Johnson-Laird, 1983). Despite the theoretical significance of understanding false beliefs its development has only recently been systematically investigated by Wimmer & Perner (1983) who have reported a sharp developmental increase around the age of 4 years in children's ability to make correct belief attributions.

Wimmer & Perner explained this sharp developmental improvement in terms of a representational deficit in the young child. Their conclusion was that 3-year-olds are not yet capable of representing alternative models of the world (Johnson-Laird, 1983), one describing the true story world and another, incompatible one, describing the protagonist's false belief about it.

Some recently reported findings, however, cast doubt on Wimmer & Perner's explanation. Shatz *et al.* (1983) reported that some children, even at the age of 2 to 3 years, explicitly contrast belief states with reality in their everyday conversations. Experimentally, Wellman & Estes (1986) demonstrated that as young as 3 years children display almost perfect understanding of the difference between real and imaginary objects, e.g. they understand that only real objects but not objects of thought can be touched and seen. Furthermore, on the basis of Bretherton's (1984) review and Leslie's (1983) theoretical analysis of pretend play one could argue that even at the age of $1\frac{1}{2}$ years children must be able to represent alternative models. For at this age the first clear instances of pretend play have been observed where children's 'knowing smiles' indicate their awareness that their pretend activity, e.g. drinking tea from an empty cup, contrasts with the reality of the cup's emptiness. At about the same age children become able to compare what is expected of them and what they think they will actually achieve (Kagan, 1981) and by 3 years they can differentiate between intended and actual outcomes in cartoons (Yuill, 1984).

Since all these studies suggest that children are able to deal with alternative models well before the age of 3 years, the question arises why at this age they seem incapable of understanding false belief which is also based on understanding alternative models (Wimmer & Perner, 1983). The present study investigated three alternative explanations. The first two focused on children's lack of relevant knowledge for inferring false belief and

the third concerned the possibility that subjects misconstrued the pragmatics of the test situation.

In Wimmer & Perner's paradigm subjects were told a story in which the protagonist placed an object (chocolate) in a location (drawer) before going out to play. In his absence the object was relocated (to a cupboard) in an unexpected transfer of which the protagonist remained unaware. When the story protagonist returned to the scene, subjects were asked where he would look for the object. In order to predict correctly that the protagonist would mistakenly look in the original location children must have understood and remembered the relevant facts explicitly stated in the story. In the story used by Wimmer & Perner the two most relevant facts were:

(1*a*) The protagonist *knew where* the object was *originally*, and
(1*b*) he did *not witness* the object's *transfer*.

If any one of these two facts is not understood the protagonist's false belief cannot be correctly inferred. The first hypothesis considered this possibility as an explanation for 3-year-olds' difficulty with false belief.

The second hypothesis focused on the possibility that 3-year-olds fail to understand the implicit assumption in the story that the protagonist relies on common-sense expectations about the normal course of events (see Fodor, 1984 for the importance of normal expectations for misrepresentation). In Wimmer & Perner's story the implicit expectation was the following:

(2) Once an object is placed in a location it can be *expected* to *remain* there.[1*]

If 3-year-olds did not assume that the protagonist had this expectation then it did not follow for them that he would be mistaken about the object's final location.

The third hypothesis was rather different from the first two. Whereas the first two assumed that the test procedure prevented children from correctly inferring the false belief, this hypothesis assumed that children were perfectly aware of the protagonist's false belief. However, despite their perfect understanding of the story they gave incorrect test answers because of a pragmatic difficulty. They may have misinterpreted the test question: 'Where will the protagonist look for the chocolate?' as meaning, 'Where *should* he look?' or 'Help him to find it!'

Experiment 1

This experiment was designed to test the three main hypotheses concerning 3-year-olds' difficulty. In addition, a fourth hypothesis about the good performance of older children was also tested.

The *first hypothesis* was that failure to make correct belief attribution is due to memory failure for relevant story facts, which was tested by two memory questions at the end of the story (see Table 1). The first question assessed children's understanding that the

*Ignorance about a surprise change is but one of two common situations in which a person may develop a false belief. The other typical situation occurs when a person is being misinformed by somebody else. In both cases, however, an expectation about normal conditions is at the source of the false belief. In the surprise-change case the expectation is about the normal course of events and in the case of misinformation the expectation is that normally people tell the truth. The misinformation paradigm has been used by Johnson & Maratsos (1977) to investigate children's knowledge of mental verbs and by Wimmer, Gruber & Perner (1984) to investigate children's concept of lying. The surprise-change paradigm, however, is preferable for the direct investigation of understanding false beliefs, since it is less prone to elicit false positives that could be caused by subjects' routine attribution of the explicitly stated misinformation as a false belief. Despite this possibility, however, children's understanding of false belief in the misinformation paradigm (Wimmer, Gruber & Perner, 1984, Expt 1, question 3) did not seem better than in the surprise-change paradigm (Expt 3).

protagonist knew where the object had been originally. Since memory of this fact had already been assessed by Wimmer & Perner (1983) the new contribution of the present study was in asking the additional second memory question. The new question tested children's understanding of the fact that the protagonist had no knowledge of the object's transfer.

Table 1. Chocolate story in three versions of explicitness of anticipation

Expectation version		
Implicit	Explicit stationary	Explicit transfer
[Scene with two rooms: drawer in living room, cupboard in kitchen].		
John's mother has bought some chocolate. He helps her unpack the bag.		
He puts the chocolate into the drawer in the living room.		He takes a chair and puts the chocolate up into the cupboard.
He remembers carefully where he put it because he will want to eat some later.		
PROMPT: Where did John put the chocolate?		
Now John goes to the playground.		
While John is away his mother needs some chocolate for a cake.	There he meets his sister. 'Guess what', he tells her. 'Mother has bought some chocolate for us. I've put it into the drawer in the living room. You can eat your part but leave my half in the drawer.' 'Sure I'll leave it there,' says his sister.	I've put it up into the kitchen cupboard. Can you do me a favour. When you go and get your part, please, put my half into the living room drawer. It's easier to get there'. 'Sure I'll put it there,' says his sister.
	John's sister goes home.	
	PROMPT: What did John ask his sister to do? (Where to leave/put chocolate.)	
At home John's mother/sister takes the chocolate out of the drawer and goes to the kitchen to cut off half. The other half is for John but she forgets to put John's half back into the drawer. Instead she puts it up into the kitchen cupboard.		cupboard and cuts off half. The other half is for John, but she forgets to put John's half into the living room drawer as he had asked her. Instead she puts it back up into the kitchen cupboard.
John is still on the playground. He couldn't see where his sister/mother put the chocolate.		
Test questions:		
'Think': Where does John think the chocolate is?		
or		
'Look': When John comes home where will he look for his chocolate?		
Control questions:		
Reality: Where is the chocolate now?		
Memory 1: Where did John put the chocolate in the beginning?		
Memory 2:		
(*a*) Where did John's mother/sister put John's part of the chocolate?		
(*b*) Where was John when mother/sister put it there?		
(*c*) So did John see her put it there?		

The *second hypothesis* was that children's difficulty with belief attribution resulted from their failure to appreciate the fact that the protagonist expected the object to stay in its old location. This was tested by contrasting the original story version where this common-sense assumption was left implicit (*implicit expectation* version) with a story version where the protagonist was described as actively holding the expectation that the object would remain in its original location. In this *explicit expectation* condition the protagonist instructed a

friend to leave the object in its original location. A concrete story example is given in Table 1.

If 3-year-olds failed belief attribution because they did not make the assumption about the protagonist's common-sense expectation then explicit description of this expectation should elicit more correct attributions. If, however, younger children cannot represent beliefs then explicit mention of the protagonist's expectation should not enable them to overcome their representational limitation.

The *third hypothesis* concerned pragmatic considerations about the form of Wimmer & Perner's test question: 'Where will he look for the chocolate?' as a test of children's belief attribution. The experimenters intended this question as a test of children's ability to predict the protagonist's behaviour as a function of his false belief. Subjects, however, may have taken this question as a request to help the protagonist to find the object (i.e. *pragmatic misunderstanding*). They may have glossed the actual question as: 'Where *should* he look?' In the present studies we tried to minimize this danger by asking 'Where does he *think* the chocolate is?' The likelihood that this would be glossed as 'Where *should* he think . . .?' is greatly reduced in comparison to the original question.

Whereas the first three hypotheses were concerned with the failure of 3-year-olds, the additional *fourth hypothesis* of this experiment investigated a possible counter-explanation for the success of 4-year-olds. In Wimmer & Perner's paradigm the protagonist had a physical association with the original location (when he put the object into it) but no such association with the other location. This confounding may have boosted correct responses of 'old location' to the test question 'Where will *he* look?' because children may have tended to respond with that location with which they associated the protagonist.

This confounding of associated location with correct test answer location can be resolved by changing the story in such a way that the new location, with which the protagonist is not associated, becomes the correct answer to the test question. This was achieved by modifying the new explicit expectation condition. Instead of instructing his friend to leave the object in its original location, the protagonist instructed his friend to transfer the object to the new location, but the friend forgot to do so. Since the protagonist still put the object into the original location himself, there was the same association with that location as in the other condition, but because of his instruction to his friend to move the object to the new location (*explicit anticipation* of transfer) the old, physically associated location ceased to be the correct answer to the test question.

Method

Subjects. Sixty-nine children from two nursery schools in Brighton were grouped into three age brackets. There were 21 children aged 3 to 3½ years (13 boys and 8 girls, 3·12 to 3·47 years, mean 3·30), 24 children aged 3½ to 4 years (12 boys and 12 girls, 3·5 to 3·92 years, mean 3·66) and 24 children 4 to 4½ years (12 boys and 12 girls, 4·09 to 4·45 years, mean 4·28). All the available children in the youngest bracket were tested. Children for the older two groups were assigned randomly with the restriction that 10 children declined to participate.

Materials. Two models were constructed similar to those used by Wimmer & Perner (1983). For each model, a 57 cm wide by 29 cm high polystyrene wall was glued onto a 29 cm by 57 cm base. The area in front of the wall was divided into two rooms by 4 cm deep polystyrene strips protruding from the wall. For the chocolate story these two rooms represented the living room and kitchen of a house. Each room contained an identifying doll's house object (settee, cooker) and a hiding location. These were a living room drawer and kitchen cupboard, represented by a yellow matchbox and a green cassette container. The other model, for the book story depicted two rooms of a nursery school each also containing a doll's house item (table and chairs, coat hooks). The hiding locations were a blue playroom cupboard and a brown cloakroom box. Three 11·5 cm high cardboard cut-outs were used to represent story characters.

Design and procedure. Each child was told the chocolate and the book story in the same expectation version. A third of the children in each age bracket were told the two stories with either *implicit expectation*, with

explicit expectation that the object will remain in the original location, or with an *explicit anticipation* of a transfer. In one story the test question was about where the protagonist would *look* for the chocolate, while in the other story it was about where the protagonist would *think* the chocolate was. The order in which the two stories were told and the kind of test question were counterbalanced and equal proportions of boys and girls were assigned to each expectation condition, as far as this was possible with eight girls and 13 boys in the youngest group.

The three expectation versions of the chocolate story are given in Table 1. The book story had essentially the same structure. The implicit expectation version involved the girl leaving a book in the cloakroom box and the caretaker shelving it in the playroom cupboard in her absence. In the explicit versions, the girl meets her friend on her way out of school and instructs him either to leave her book in the playroom cupboard after reading it, (explicit expectation), or to take her book from the cloakroom and reshelve it in the playroom cupboard (explicit anticipation of transfer).

Subjects were told both stories in one testing session. Each story was played on a tape-recorder with the experimenter acting out the story. Before the story began, the subjects were asked to identify the rooms of the model and the objects in them. The significance of the outside wall was stressed; 'If the boy is out on the playground he can't see inside the house.'

At crucial points during the story the tape-recorder was stopped and prompt questions were asked. Where subjects failed to give the correct answer, a clue was given and the story was replayed until the answer was correct. At the end of each story the 'think' or 'look' test question was asked followed by control questions (see Table 1). The first control question assessed subjects' knowledge of the object's actual location (*reality question*). The remaining two controls tested subjects' memory for the main events in the story. *Memory question 1* tested subjects' understanding that the protagonist knew where the object was located originally. *Memory question 2* tested understanding that the protagonist was unaware of the object's transfer to the new location (or failure to be transferred).

Results

Children's responses to the test questions consisted either of a correct false-belief attribution or of an incorrect attribution of knowledge about the real location to the ignorant protagonist. The percentages of correct attributions are analysed for between-subjects factors first and then for within-subjects factors.

Between-subject analysis. Two stepwise logistic regression analyses were carried out for between-subject factors on the proportion correct responses to test questions. One analysis was carried for the first story, the second analysis for the second story, using the BMDP statistical software package (Dixon *et al.*, 1981). For factors expectation (implicit vs. explicit expectation vs. explicit anticipation), age, story (chocolate vs. book), and test question (look vs. think) a saturated model including all main and interaction effects was considered. Factor sex was considerd as a main effect only.

Analyses for both stories showed only age significant ($\chi^2 = 17{\cdot}41$, d.f. $= 2$, $n = 69$ for first and $\chi^2 = 28{\cdot}43$ for second story, both $P < 0{\cdot}001$). The corresponding means are shown in the last row of Table 2 and will be discussed in more detail below in context of the within-subjects analysis. For all other effects: $P > 0{\cdot}14$.

It was particularly striking that there was no discernible effect for expectation ($P > 0{\cdot}59$, for both analyses). The first two percentages in the last column of Table 2 show that performance on implicit and explicit expectation version of the stories was almost identical. This null result suggests that making the common-sense assumption about the protagonist's expectation did not pose a major difficulty for the younger children's belief attribution.

The second and third percentage in the last column of Table 2 indicate that there was a slight but not significant ($P > 0{\cdot}50$, both analyses) difference between explicit expectation that the object would remain in its original location (63 per cent correct) and the explicit anticipation that it would be transferred (50 per cent). In particular, performance by the oldest age group was almost perfect even for an anticipated transfer which dissociated physical association from the correct test answer: seven of eight subjects gave correct answers on the first and all eight on the second story. Even many

Table 2. Percentage correct responses to test and memory questions in Expt 1

	Age [years]			
Factors	3–3½	3½–4	4–4½	All ages
Test questions				
Explicitness				
Implicit	36	69	75	61
Explicit expectation	29	63	94	63
Explicit anticipation	0	50	94	50
Test question				
Think	19	58	92	58
Look	24	62	83	58
Total	21	60	87	
Memory questions				
Reality	7	8	4	8
Memory 1	2	6	2	5
Memory 2 *a*	0	2	2	2
b	0	0	0	0
c	14	4	0	7

3½-to 4-year-olds gave correct answers: three of eight on the first and five on the second story. Hence, even if some of the younger children may have given correct answers in the other conditions because of a physical association between the protagonist and the object's original location, the good performance in the explicit anticipation of transfer condition confirms that by the age of 4 years most children are able to understand false belief. Only the youngest group showed no sign of false-belief understanding in the explicit anticipation condition. This might be an indication that the youngest age group's correct responses in the other conditions might have been based on a physical association strategy. However, this interesting possibility remains purely speculative since the interaction between age and expectation was not statistically significant ($P=0{\cdot}15$ for first and 0·22 for second story).

The other important finding was that there was no discernible effect of the kind of test question asked ($P>0{\cdot}90$, for both analyses). In fact when averaged across first and second story the percentages correct responses were identical for the two questions (last column in Table 2). This negative result suggests that children who are asked 'where will he look for the object' are not misled into interpreting the question as 'where *should* he look for the object', since this interpretation should have been prevented to some degree, at least, by the use of 'think'.*

Within-subject analysis. First vs. second story. Table 3 shows the contingency between the first and second story detailed by age. The right most column shows that a vast majority of children gave consistent answers. They either gave correct or incorrect answers on both stories, which confirms that only very few children were guessing the answers to test questions. This impression is further strengthened by the fact that of the

*In another experiment on 32 4- to 5-year-olds a contrast was made between 'Where will he *go* to buy ice cream?' and 'Where does he *think* the ice cream van is?' with the same negative result: 12 of 16 gave correct answers to the 'think' question and 11 of 16 to the 'go' question.

12 children who gave inconsistent responses 10 gave incorrect responses on the first but a correct response on the second story, while only two children showed the opposite pattern. This difference is significant (McNemar's test: $\chi^2 = 4{\cdot}08$, d.f. = 1, $P < 0{\cdot}05$) and suggests that children were able to learn from their experience on the first story. The first story with its test and control questions may have sensitized children to what the experimenter considered important and so they knew better on the second story what facts to consider for answering the test question. This improvement with experience is also reflected in the percentage of correct responses when stories are considered independently (centre panel of Table 3). In particular the percentages for the second story show close to perfect belief understanding by children above the age of 4 years, but still very little understanding in the 3- to 3½-year-old-group.

Table 3. Percentage and number of subjects giving correct answers to test questions in two stories of Expt 1

	Age [years]			
Correct answer to test question	3–3½	3½–4	4–4½	All ages
Contingency between stories				
Both stories (+ +)	4	11	19	34
Second only (− +)	1	5	4	10
First only (+ −)	0	2	0	2
Neither story (− −)	16	6	1	23
Stories independent				
First story (%)	19	54	79	
Second story (%)	24	67	96	
Subjects who gave incorrect responses on first story. Rate of improvement on second story (%)	6	45	80	

In fact Table 3 indicates that the youngest group hardly improved their responses at all from first to second story, even though they had the largest scope for improvement. This difference between age groups can be seen most clearly if one focuses on those children who gave a wrong answer in the first story and then considers the percentage that were able to do better on the second story (last row of Table 3). Although there were 17 children in the youngest group who gave a wrong answer to the first test question only one of them did any better on the second story (6 per cent improvement), whereas out of the five children in the oldest group with a wrong answer to the first story all but one answered the second story correctly (80 per cent improvement). This age-related increase in improvement rate was tested statistically by contrasting the youngest with the two older groups combined ($\chi^2 = 7{\cdot}66$, d.f. = 1, $n = 33$, $P < 0{\cdot}01$).

The low percentage of correct test answers by the youngest group together with their inability to profit from experience on a first story suggests that 3- to 3½-year-olds face a deeper problem than just inattention to relevant facts or lack of knowledge about normal expectations.

Control questions. Children's answers to test questions have to be evaluated in relation to their ability to comprehend the relevant story facts. Fortunately only 13 children gave any wrong answers to any of the control questions in the two stories: six

in the youngest, five in the middle and two in the oldest group. So, if one limits the analysis to only those children who gave perfect answers to control questions the interpretation of results does not change. Concerning the older children's good performance one can still claim that 95 per cent gave correct responses on the second story, and even 100 per cent correct responses in the anticipated transfer condition which was supposed to be more difficult because it did not allow the use of a physical association strategy.

Concerning the bad performance by the youngest group on the test questions the picture became even clearer. Only 20 per cent gave consistently correct responses on *both* stories whereas 80 per cent gave wrong responses on *both* stories. Hence, a vast majority of younger 3-year-olds made consistently wrong belief attributions even though they remembered correctly where the protagonist put the object originally (memory 1) *and* that the protagonist was not aware that it had been moved (memory 2).

Summary. The results are summarized according to the three main hypotheses described in the general introduction and the additional fourth hypothesis specifically addressed by this experiment. In addition a fifth point arose from the data.

(1) Children's difficulty with false-belief attribution cannot be accounted for by lack of knowledge due to poor retention of the essential facts that the protagonist knew the object's original location and was unaware of its transfer. Results showed positively that many of the younger children who understood and remembered these facts correctly, still made consistently wrong belief attributions.

(2) It is unlikely that children fail to make correct false-belief attribution because they lack knowledge of normal expectations that an object should remain where it is originally placed. This is unlikely, because when the protagonist's expectation was made explicit children's belief attributions did not improve.

(3) It was thought that 3-year-olds may have given wrong answers to belief test questions because of a pragmatic misunderstanding. They glossed 'Where *will* he *look* . . .?' as 'where *should* he *look* . . .?' This possibility has become unlikely, since an attempt to block such a misinterpretation, by using 'think' instead of 'look', did not produce more correct belief attributions.

(4) In the original test procedure 4-year-olds may have given false positives because the protagonist was physically associated with the correct-answer location. However, when this association was broken in the explicit anticipation of transfer condition 4-year-olds still made near-perfect belief attributions.

(5) The negative results that explicit expectation cues and pragmatic precaution failed to improve belief attributions suggests a cognitive limitation in belief representation. This suggestion is underlined for the 3- to 3½-year-olds by their failure to improve on the second story, as was expected if they are bound by cognitive limitations. In contrast initial performance by children over 4 is not a reflection of a cognitive limitation since they were able to improve on second story exposure. Performance by older children, who in principle can understand false belief, is therefore likely to be sensitive to the mode of presentation of the test story.

Experiment 2

It was surprising that explicit description of the protagonist's expectation had no positive effect on children's belief attribution in the first experiment. Our suspicion was that if we had an even better way of getting this expectation across it surely would enable even the younger 3-year-olds to understand false belief. In the present experiment we tried to make 3-year-old children comprehend another person's mistaken belief by giving them direct

experience of how they themselves could be misled when confronted with the same situation as the other person.* Subjects together with a friend were shown to the experimenter's room with the promise that the experimenter would show them what she had in her box. The friend, however, was told to wait his turn outside the room. Inside the room with doors closed, the subject was shown a Smartie box, a container of a desirable candy highly familiar to all subjects. Asked what they thought was in that box they all said 'Smarties'. They were then shown that they were wrong and that the box actually contained a pencil. The pencil was then put back into the box and the box closed again. Subjects were then asked a control question about the actual content of the box, and a test question about their own previous belief about the content of the box. Then they were told that it was their friend's turn. She would be shown the closed box as the subject had seen it initially and asked what was in the box. Subjects had to indicate what they expected their friend would think is in the box.

In this experiment we also tried to control for a different pragmatic difficulty. The hypothesis was that young children may find it hard to answer the test questions correctly because it involves saying something false. To avoid this difficulty half the subjects were shown the Smartie box with the pencil *and* some Smarties in it. It was thought that this might overcome a possible reluctance to attribute false propositions, since in this condition the correct answer 'Smarties' consisted of a partially correct description of the full content (Smarties + pencil). Children had only to refrain from mentioning the second, atypical item (pencil).

Method

Subjects were 32 children aged 3·1 to 3·9 years (mean = 3·5) from a nursery school in Brighton. Half of them were assigned to the condition with the pencil in the box, the other half to the condition with a pencil and Smarties in the box. The exact wording of questions was as follows. Control: 'Can you remember what's inside here?'; test question for *self*: 'But what did you think was in here?' and for *other*: 'What will [name of friend] think is in here?'

Results

Three children in the Smarties + pencil condition failed to remember that there was a pencil in addition to some Smarties in the box (control question). Their responses to the test questions were therefore meaningless. Responses to test questions by the remaining 29 subjects are shown in Table 4. Percentages in the last column show minimal, non-significant differences between content conditions (for self-attribution: $\chi^2 = 0{\cdot}12$, d.f. = 1, $P > 0{\cdot}90$; and for other attribution: $\chi^2 = 0{\cdot}02$, d.f. = 1, $P > 0{\cdot}90$). There was therefore no indication that children may fail test questions because they are reluctant to attribute false propositions to themselves or a friend.

The lower part of Table 4 shows the contingency between self and other attribution. The last column shows that quite a few subjects were able to remember their own false belief correctly but incorrectly attributed knowledge of the real content to their ignorant friend (self only). Only one subject showed the opposite response pattern (other only). This difference between the two test questions is significant on McNemar's test: $\chi^2 = 4{\cdot}9$, d.f. = 1, $P < 0{\cdot}05$).

Discussion

Overall, the results confirmed on an English sample that understanding false belief develops around the age of 3 to 4 years. Children older than 4 years tend to make accurate

*This procedure was partly inspired by a procedure used by Flavell, Flavell & Green (1983) for testing children's appearance–reality distinction, and was developed in conjunction with the work by Hogrek *et al.* (1986).

Table 4. Percentage and number of subjects giving correct answers to test questions in Expt 2

	Age [years]		
Type attribution	3–3½	3½–4	All ages
to self			
Pencil + Smarties (%)	50 ($n=6$)	86 ($n=7$)	69
Pencil only (%)	75	75	75
Both tasks	64	80	
to other			
Pencil + Smarties (%)	33 ($n=6$)	57 ($n=7$)	46
Pencil only (%)	37	50	44
Both tasks	35	53	
Contingency between attributions			
Both correct	5	7	12
Self only	4	5	9
Other only	0	1	1
Neither correct	5	2	7

Note. $n=8$ for all cells except where indicated otherwise.

attributions of false beliefs while children younger than 3½ years have great difficulties with it. This developmental pattern has been found in several studies for Austrian children (Wimmer & Perner, 1983; Hogrefe, Wimmer & Perner, 1986), American children (Johnson & Maratsos, 1977) and English children (Baron-Cohen *et al.*, 1985; present study). The percentages of correct test responses from all these studies are summarized in Table 5.*

The summary in Table 5 shows that there is a minority but still a substantial proportion of 3- to 4-year-olds who are able to display understanding of false belief. Even when the younger half of this one-year span was singled out there was still a noticeable proportion (24 per cent on second story in Exp 1, and 28 per cent in Expt 2) who understood false belief.

The great majority, however, still showed little sign of understanding false belief despite concentrated effort to remove every possible source of difficulty other than the concept of false belief itself. Although most of the younger 3-year-olds were able to remember all story facts (Expt 1) a majority made consistently wrong attributions which were resistant to attempts of directing attention to the other person's expectation (Expts 1 and 2). Pragmatic improvements in the test procedure, i.e. ensuring that the test question was not wrongly construed as a request to help the mistaken protagonist to clear up his false belief (Expt 1), and preventing subjects from having to say something false (Expt 2), also failed to help. Furthermore, the younger 3-year-olds did not profit from prior exposure to an identical

*This is considerably better than what was found in Wimmer & Perner's (1983) original study (see Table 5). The discrepancy may partly be due to improved methodology. In particular the use of prompts (see Table 1), which was used in many of the later studies, may have helped. Also there appears to be a small but consistent difference between English and Austrian children in Table 5. However, in an unpublished study where a uniform method was used in both countries (Table 5: unpublished data), the difference was a minimal 9 per cent between English and Austrian children.

Table 5. Percentage of correct belief attributions

Country Publication Experiment	Age span [years]	
	3–4	4–5
Austria		
Wimmer & Perner (1983) Expt 2		
Disappear condition	15	76
Displace condition	0	41
Hogrefe, Wimmer & Perner (1986)		
Expt 4 (Story)	17	56
Expt 5	25	—
Expt 1 (Life)	6	44
Expt 2	21	71
Expt 3	36	—
Unpublished data (Anglo-Austrian Experiment)	39	53
USA		
Johnson & Maratsos (1977)		
'Seen' condition	30	82
UK		
Baron-Cohen *et al.* (1985)	—	85
Present Study		
Expt 1 (Story)	40	87
Expt 2 (Life)	45	—
Unpublished data (Anglo-Austrian Experiment)	35	75

task (Expt 1). So these efforts to uncover a previously unnoticed competence of 3-year-olds met with little success.

If false-belief difficulties do reflect a conceptual limitation then what is the nature of this conceptual deficit? Subjects have to understand that another person will assign a conflicting truth value to a critical proposition (e.g. 'Box contains Smarties' is TRUE) which conflicts with the value they themselves assign (i.e. 'Box contains Smarties' is FALSE).

It is important to notice that a grasp of conflicting truth values is required only for understanding false belief, which tends to develop after the age of 3 years, but not for those concepts about the mind which are understood before the age of 3 years. It is not required in pretend play since everybody involved can be seen as attaching the same reality status to pretend statements and statements about the world. The same holds for understanding the distinction between real and imaginary objects assessed by Wellman & Estes (1986) and for understanding the distinction between expected and actual performance (Kagan, 1981) and between intended and actual outcomes (Yuill, 1984).

By contrast, consider the situation in Expt 2 where subjects were asked: 'I'll show your friend this box just like this (closed), and I'll ask your friend: "What's in there?" What will your friend think is in there?' Clearly, what is at stake is how the friend will answer the experimenter's question. Subjects have to understand that their friend would give the wrong answer not because he wanted to get it wrong but precisely because he wanted to get the answer right. That a desire to answer correctly can result in a wrong response can only be properly explained by the fact that their friend mistakenly thought that the *false* answer was the *true* one. Without the ability to understand assignment of conflicting truth values it would seem impossible to understand how their friend who *wants* to give a *correct* answer would *end up saying* something *wrong*.

In contrast, for answering the self-attribution question in Expt 2 ('What did you think was in there?') no understanding of conflicting truth values may have been necessary, since

subjects could have simply remembered their false response without understanding the reasons why they had given that wrong response. For this reason the hypothesis that 3-year-olds have difficulty understanding conflicting truth values can also explain the observed difference between self- and other-attribution in Expt 2.

However, understanding of conflicting truth values can be assessed within the context of self-attribution. It seems that Flavell, Flavell & Green (1983) have tested exactly this ability in their test of children's understanding of the distinction between real and apparent. As in Expt 2, subjects were first given only restricted and misleading information about the identity of an object and only later they were allowed to find out the truth. At first they were allowed to only look at an object that looked like solid rock but which upon full manual exploration turned out to be soft sponge. Unlike Expt 2, subjects' understanding of the misleading visual appearance was not assessed by asking about their memory, i.e. 'What did you think this was when you first saw it?' but by asking: 'When you look at this with your eyes right now, does it look like a rock or does it look like a piece of sponge?' (Flavell, Flavell & Green, 1983, p. 102). This question may look deceptively innocuous to an adult, but the concept of 'look like' is complex. One must be able to understand that under hypothetically restricted epistemic access (just viewing) one would ascribe different truth values to statements about the object's identity than one does under present knowledge gained without these restrictions (full manual exploration), i.e. if I were just to look at it I would think: 'It is a rock' is TRUE, while to my full knowledge: 'It is a rock' is FALSE, and 'It is a sponge' is TRUE.

In view of this theoretical analysis it is interesting that children's performance on the appearance–reality distinction shows a marked improvement from 3–4 years to 4–5 years (Flavell, Flavell & Green, 1983; Flavell, Green & Flavell, 1985).

A similar perceptual epistemic problem is involved in level 2 perspective taking tasks (Masangkay *et al.*, 1974). In a typical task children were shown a turtle drawn on a paper lying between themselves and the experimenter, so that its back was closer to them and its feet closer to the experimenter. Children were asked: 'Do you/I see the turtle lying on its back or standing on its feet:' These questions test understanding that from one perspective one interprets the drawing so that 'Turtle is lying on its back' is TRUE, while from the other perspective so that 'Turtle is standing on its feet' is true and by implication that 'Turtle is lying on its back' is FALSE. Again, 3- to 4-year-olds had difficulty with this task (Masangkay *et al.*, 1974; Flavell, Everett, Croft & Flavell, 1981).

In summary, we are proposing the following revision of Wimmer & Perner's (1983) position. Children younger than 3 years can represent alternative models and assign appropriate truth values to these models, which enables children to engage in pretend play, understand pretend in others, distinguish between expected and likely performance (Kagan, 1981) and between intended and actual outcomes (Yuill, 1984), and understand the distinction between real and imaginary objects (Wellman & Estes, 1986). In contrast, it is only when children are older than 3 years that they can assign conflicting truth values to models. Such assignment is necessary for understanding that other people entertain false beliefs, i.e. think true what oneself knows to be false. It is necessary for understanding the distinction between appearance and reality (Flavell, Flavell & Green, 1983), since understanding appearance requires understanding what one would think if one restricted one's informational access to the apparent phenomena only. It is also required for level 2 visual perspective tasks (Masangkay *et al.*, 1974) where depending on one's particular perspective one would hold different propositions as true. Existing data are consistent with the view that the former group of tasks which do not involve assignment of conflicting truth values are mastered before or at the age of 3 years while the latter group of tasks which does involve this conceptual complication are not understood before the age of 3 years.

Acknowledgements

This project was financially supported by Research Grant HR 8473 from the Social Science Research Council of the UK to Josef Perner. The authors thank Miss Rye, Head of Tarnerland Nursery School, Miss Branson, Head of White House Nursery, Mrs Waddup, Head of Hangleton First School, their staff and pupils, and the County Education Officer of East Sussex for their friendly cooperation.

References

Baron-Cohen, S., Leslie, A. M. & Frith, U. (1985). Does the autistic child have a 'theory of mind'? *Cognition*, **21**, 37–46.

Bretherton, I. (1984). Representing the social world in symbolic play: Reality and fantasy. In I. Bretherton (ed.), *Symbolic Play*. New York: Academic Press.

Dixon, W. J., Brown, M. B., Engelman, L., Frane, J. W., Hill, M. A., Jennrich, R. I. & Toporek, J. D. (1981). *BMDP Statistical Software*. Berkeley, CA: University of California Press.

Flavell, J. H., Everett, A. B., Croft, K. & Flavell, E. R. (1981). Young children's knowledge about visual perception: Further evidence for the Level 1–Level 2 distinction. *Developmental Psychology*, **17**, 99–103.

Flavell, J. H., Flavell, E. & Green, F. L. (1983). Development of the appearance–reality distinction. *Cognitive Psychology*, **15**, 95–120.

Flavell, J. H., Green, F. L. & Flavell, F. L. (1985). Development of knowledge about the appearance–reality distinction. Unpublished manuscript, Stanford University.

Fodor, J. A. (1984). Semantics, Wisconsin style, *Synthese*, **59**, 231–250.

Hogrefe, G. J., Wimmer, H. & Perner, J. (1986). Ignorance versus false belief: A developmental lag in attribution of epistemic states. *Child Development*, **57**, 567–582.

Johnson, C. N. & Maratsos, M. P. (1977). Early comprehension of mental verbs: Think and know. *Child Development*, **48**, 1743–1747.

Johnson-Laird, P. N. (1983). *Mental Models*. Cambridge: Cambridge University Press.

Kagan, J. (1981). *The Second Year*. Cambridge, MA: Harvard University Press.

Leslie, A. M. (1983. Pretend play and representation in the second year of life. Poster presented at the British Psychological Society's Developmental Section Conference, Oxford, September.

Masangkay, Z. S., McCluskey, K. A., McIntyre, C. W., Sims-Knight, J., Vaughn, B. E. & Flavell, J. H. (1974). The early development of inferences about the visual percepts of others. *Child Development*, **45**, 357–366.

Shatz, M., Wellman, H. M. & Silber, S. (1983). The acquisition of mental verbs: A systematic investigation of the first reference to mental state. *Cognition*, **14**, 301–321.

Wellman, H. M. & Estes, D. (1986). Early understanding of mental entities: A reexamination of childhood realism. *Child Development*, **57**, 910–923.

Wimmer, H., Gruber, S. & Perner, J. (1984). Young children's conception of lying: Lexical realism–moral subjectivism. *Journal of Experimental Child Psychology*, **37**, 1–30.

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

Yuill, N. (1984). Young children's coordination of motive and outcome in judgements of satisfaction and morality. *British Journal of Developmental Psychology*, **2**, 73–81.

Received July 1985; revised version received 26 February 1986

Requests for reprints should be addressed to either Heinz Wimmer, Institut für Psychologie der Universität Salzburg, Akademiestrasse 22, A- 5020 Salzburg, Austria or Josef Perner, Experimental Psychology, Sussex University, Brighton BN1 9QG, UK.

Susan R. Leekam is also at Sussex University.