Egocentric definiteness errors and perspective evaluation in preschool children[☆]

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1. Introduction

Children's use of definites vs. indefinites has been the focus of considerable attention for the past 40 years. In that period, the field has also seen significant theoretical developments in the area of discourse pragmatics / information structure. This in turn has enhanced our understanding of various aspects of children's competence in that area. In particular, it has been shown that the information structure knowledge necessary to encode topic vs. focus is in place at least as early as 2;6 and that the *linguistic* competence underpinning the use of definites vs. indefinites is in place from around 2;6 (De Cat, 2009, 2011). However, a small margin of errors in particular contexts remain unaccounted for. This study investigates so-called 'egocentric' errors in preschool children's use of definiteness distinctions to encode the information status of discourse referents. Egocentric errors (Maratsos, 1974; Warden, 1976; Karmiloff-Smith,

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¹Following Lambrecht (1994) and Erteschik-Shir (2007) among many others, Information Structure is understood here to intervene at all meaning-bearing levels of the grammatical system. It is defined as "the cognitive domain mediating between the various modules of linguistic competence (syntax, phonology, and morphology) and other cognitive faculties that serve the central purpose of the fixation of belief by way of information update" (Zimmermann and Féry, 2009).

1979; Emslie and Stevenson, 1981) arise where the child uses a definite on first mention of a specific referent, in absence of hearer knowledge, as in (1).

(1) #He takes the block. (block unknown to hearer)

The encoding of information in conversation is intrinsically an interactive process, in which the speaker has to evaluate the hearer's knowledge state, i.e. monitor which referents are new or salient from their point of view, in order to determine how to best encode them in their own speech. Beyond the linguistic competence required to adequately map the information status of referents onto the appropriate structures and lexical items, what is also required is the cognitive ability to perceive differences in perspective between one's own and that of one's addressee. Maratsos (1974, 454) argues that young children often have difficulty with keeping track of their listener's referential knowledge, especially before the age of 5.

In the literature, the investigation of children's mastery of definiteness distinctions to encode referential status is mainly based on elicitation tasks. Usually, a context is established by telling the child a short story (Karmiloff-Smith, 1979; Maratsos, 1974) (sometimes with the help of pictures, as in Zehler and Brewer 1982) or by witnessing a scene (Schaeffer and Matthewson, 2005). The child is then asked a question about one of the referents (Maratsos, 1974; Schaeffer and Matthewson, 2005) or made to complete the story (Zehler and Brewer, 1982). Another design consists in making the child tell a story to a blindfolded interviewer, based on a sequence of pictures (Warden, 1976, 1981; Emslie and Stevenson, 1981; Power and Dal Martello, 1986). In all these designs, the child has to mention referents that have not yet been introduced in the context. Adults are assumed to produce indefinites in such cases (Kadmon, 2000). In contrast to the above, Schafer and de Villiers (2000) relied on children's own world as a source of referents known to themselves but not their addressee. van Hout, Harrigan, and de Villiers (2010) also used an innovative research design, investigating both production (with and without visual prompts) and comprehension — the latter via a truth-value judgement task (to test which interpretations of a vs. the are available) and a referent-selection task (to test the preferred interpretation of a vs. the).

A common assumption in the generative literature has been that pragmatic competence lags behind syntactic competence in first language acquisition. Schaeffer and Matthewson (2005), following Schaeffer (2000), argue that very young children lack the pragmatic Concept of Non-Shared Assumptions, which states that "Speaker and hearer assumptions are always independent" (Schaeffer and Matthewson, 2005, 69). Schaeffer (2000) argues that this concept becomes available to the child around age 3 because of maturation. Schaeffer and Matthewson (2005, 86) suggest that this concept is acquired on the basis of experience, because of communication breakdowns. What remains unclear on that account is why egocentric errors remain marginal before the age of 3 (75% of items in the relevant condition are error-free in the Schaeffer and Matthewson study): what leads the child to postulate independence of assumptions most of the time, in spite of immaturity of the relevant pragmatic concept?

If in most cases (under identical conditions) children correctly use indefinites on first mention of a referent, we should assume that they have the relevant linguistic competence, i.e. that they know that indefinites are used to signal to the hearer the existence (and/or relevance) of a specific referent not yet mentioned in the discourse and not yet present to the hearer's mind. The use of definites in a limited number of cases could arise from a failure to *evaluate* either what has been mentioned before in the discourse, or what isn't present to the hearer's mind.

Interestingly, children's rates of egocentric errors vary a lot among groups of similar ages, not only across studies, but also within studies. Maratsos (1974) reports a significant amount of variation among 4-year-olds, which was not straightforwardly correlated to age. Striking differences are observed even between studies using identical designs. For instance, Warden (1976) and Emslie and Stevenson (1981) report 54% vs. 16% of egocentric errors respectively in their 3-year old group. Schafer and de Villiers (2000) is the only study reporting

a total absence of egocentric errors.² This suggests that the way in which the common ground is established has a significant impact on the child's ability to keep track of their interlocutor's perspective. In particular, the use of visual prompts in most studies may have played an important role: in spite of the blindfold, children may have assumed that what was visible to themselves was also visible to their addressee. This aspect of cognitive development is part of Theory of Mind, i.e. the ability to evaluate the mental states of others, and in particular their beliefs and desires (see e.g. O'Neill, Astington, and Flavell 1992; de Villiers 2007; Doherty 2009). Aichhorn, Perner, Kronbichler, Staffen, and Ladurner (2006) have demonstrated that visual perspective tasks only require a specific component of Theory of Mind: that which enables the realisation that minds can take different perspectives on the world because they represent it differently. In their study of preschool children's use of a vs. the, Schafer and de Villiers (2000) explicitly predict that Theory of Mind failers should use the differently from adults. van Hout, Harrigan, and de Villiers (2010) also invoke (second order) Theory of Mind as a possible prerequisite necessary for the child to be able to evaluate definiteness choices from a dual perspective (their own and that of their interlocutor). As for the delayed pragmatic Concept of Non-Shared Assumptions invoked by Schaeffer and Matthewson (2005), it also seems amenable to a Theory of Mind interpretation, but the authors themselves chose not to frame it as such, invoking the following reasons: lack of clarity as to when Theory of Mind is acquired, and lack of definition of what it encompasses (see their fn 13, p. 69).

The present study is the first to investigate experimentally whether 'egocentric' errors can be explained by aspects of Theory of Mind development, and in particular the lack of awareness that seeing leads to knowing (O'Neill, 1996).

²They do report *the*-over use in one condition where a group of unindividuated referents is introduced and then something happens to one of them, but do not attribute these errors to egocentricity (or Theory of Mind development — see below). Rather, the difficulty is argued to arise from having to select one object from a set of like-objects (Schafer and de Villiers, 2000, 618).

2. Methods

2.1. Subjects and tasks

45 monolingual French-speaking children from middle-class background participated in the study. There were 3 groups of 15 children, but the data from two of the youngest children had to be discarded: one because she only produced determinerless nouns in isolation, the other because of technical problems with the recording. The mean ages were: 2;11 for Group A (2;6.22 - 3;3.21), 4;0 for Group B (3;5.17 - 4;5.28) and 5;2 for group C (4;6.10 - 5;6.15). Children were recruited, recorded and filmed in their kindergarten.

Two experiments were conducted in sequence after a warm-up session. First a Theory of Mind test (based on O'Neill et al. 1992), and then two story-elicitation tasks. The latter are described first.

At the beginning of the story elicitation tasks, one interviewer pretended to have pain in her eyes and asked to be blindfolded. Once blindfolded, she demonstrated to the child that she couldn't see anything. Then she asked the child to find a 'book' (there were 2 within reach on the table), and to tell her the story. The second experimenter took care of the filming and recording. The blindfolded experimenter would remind the child from time to time that she couldn't see anything by asking clarification questions or reminding the child of the blindfold.

Based on observations from previous studies, the plots and elicitation material were designed to minimise the impact of factors likely to mask or interfere with children's linguistic competence. The plots were very simple, and consisted essentially in the progressive introduction of new characters joining a group of established characters. To discourage recourse to the thematic strategy (Karmiloff-Smith, 1985; Bamberg, 1986), according to which children tend to treat main (especially human) characters as topics³ even on first mention, only animals were used, and no character was promoted to a more prominent

³For the present purpose, a sufficient definition of topics is what the sentence is about (Reinhart, 1981).

position in the story (aside from any effect arising from order of mention). The animals were very different from each other in an attempt to facilitate recognition and help children establish continuity between the pictures. Accommodation via bridging⁴ was discouraged by the fact that the animals appeared in a setting they don't normally belong to. Each story consisted of 5 pictures made of colourful cut-outs by a professional illustrator.

One story was set in a city. In picture 1, a hen is walking in front of high-rise buildings. In picture 2, she meets a dog. In picture 3, the dog and the hen see a sheep arrive on its bicycle. The dog is waving to the sheep. In picture 4, the dog and the hen meet a goat with a bell around its neck. In picture 5, they see a pig flying a blue plane. The hen is waving to the pig and the pig is waving back.

The other story was set on an island. Picture 1 shows a blue bird on the island, close to a coconut tree. On picture 2, the bird is on the tree, and a snake appears in the foreground. They are looking at each other. On picture 3, the snake has climbed up the tree and is near the bird. Both are looking at a zebra in the foreground. On picture 4, the zebra has joined the other animals, and a tiger appears in the foreground. On the last picture, a rhinoceros appears. All the other animals have gathered on the tree, which is now bending dangerously towards the ground. There is a big smiling sunshine on all 5 pictures.

As in other story-elicitation studies of definiteness (e.g. Maratsos 1974; Emslie and Stevenson 1981), in the present design the child was made to tell the story to a blindfolded person. The aim was to control for the possibility that the child would rely on the salience of referents in the visual context to license deictic uses of definites on first mention. However, if (some of the) children do

⁴Bridging is the process by which the existence of a particular referent is derived from that of another because of a correlation between the two, thereby licensing the introduction of the derived referent as definite on first mention (see e.g. Heim 1982). For instance, the introduction of *the door* as a definite on first mention in (i) is licit because its reference can be derived from the house previously introduced.

⁽i) She left her house in a hurry and forgot to lock the door. (Door = new referent)

not have the prerequisite ToM abilities, they would not be able to appreciate that their addressee cannot see the pictures in spite of the blindfold. This was tested on the children in this study during the same recording session as the story-elicitation task.

The ToM test aimed to ascertain whether the children were able to appreciate that seeing leads to knowing. Its design was inspired from O'Neill et al. (1992). The test required children to answer 'yes' or 'no' to some questions, which were kept as simple as possible. The child was first invited to choose two animal puppets, and asked to identify them (e.g. as 'the lion' and 'the monkey'). One of them (e.g. the lion) felt tired and went to bed, where it stayed, asleep, for the duration of the test. A box then appeared, and the active puppet looked inside. In the first condition, the child was also allowed to look inside the box. In the second condition, the child could not see what was in the box. Then (in both conditions) the child was asked the following questions in turn (accompanied by pointing to the relevant pupper each time): (1) Did the monkey look inside the box? (2) Did the lion look inside the box? (3) Does the monkey know what is in the box? (4) Does the lion know what is in the box? Note that this test required children to have an explicit understanding of the relation between the seeing and knowing (because of the know-question). The most conservative analysis would require Theory of Mind passers to answer correctly on all 8 questions.

3. Results of the story-elicitation experiment

Egocentric errors consist in using a definite expression upon first mention of a referent in a context where it is not uniquely identifiable by the addressee. Because what is at stakes here is the child's ability to evaluate their addressee's knowledge state, all cases in which unique identification does not depend on this evaluation were excluded from the counts.⁵ In principle, because the context was controlled for in this experiment, two conditions should be sufficient to

 $^{^5}$ The items excluded were: referents that could be encoded as definites on first mention (because of bridging, uniqueness, genericity — see De Cat 2011 for details), proper names, and noun phrases with a missing or unclear article.

analyse the data: one in which unique identification obtained, and one in which it didn't. The identifiability of a referent depended entirely on whether it had been previously mentioned in the context. However, because the context was artificially broken up into pictures, one extra level was distinguished so that each picture was treated as a mini-context. Children's sensitivity to the information status of referents could therefore be investigated independently of their ability to see the continuity between the pictures.

Given the above, three degrees of identifiability are distinguished in the analysis: "Story-new, picture-new" corresponds to referents mentioned by the child for the first time in the whole story, i.e. not uniquely identifiable in the context; "Story-old, picture-new" corresponds to referents mentioned by the child for the first time in a particular picture, but already mentioned earlier in the story; "Story-old, picture-old" referents are old information both in the picture context and in the story context. From an adult point of view, only "Story-new, picture-new" referents should be treated as not uniquely identifiable by the addressee (therefore requiring the use of an indefinite). Referents in the "Story-old, picture-new" category are effectively old information from a discourse point of view, so a definite is expected in such cases.

Note that the three conditions defined above do not correspond to particular levels in Gundel, Hedberg, and Zacharski's (1993) Givenness Hiearchy (summarised in (2)).

(2)

According to the Givennes Hierarchy, the form that a speaker can appropriately use for an intended referent in a given context and the interpretation that form will have depend on (i) the highest cognitive status the referent has for the addressee in that context and (ii) the relevance of providing particular information about cognitive status (and conceptual content) in that context.⁶

In the *Story-new Picture-new* condition, either of the bottom two statuses on the hiearchy are possible (i.e. referential or type-identifiable).⁷ In the other two conditions, forms associated with any of the top four statuses are acceptable — and these are all definite. All that is relevant to the investigation of egocentric errors is the threshold from *referential* to *uniquely identifiable* (and not the choice of a particular givennes status beyond that).

The difference between the Story-old Picture-new and the Story-new Picture-new conditions could be argued to correspond to different levels of activation (e.g. in Lambrecht's 1994 framework). As each picture was narrated in a very small number of short utterances (often just one per picture, especially in the youngest children), the deactivation of any referent mentioned in the preceding picture could be expected to be minimal. However, in the absence of a theory predicting the exact amount of deactivation of referents across objectively measurable stretches of discourse, and how this varies between children and adults, the old information condition was subdivided in two (Story-old Picture-new and Story-new Picture-new) to allow a more fine-grained analysis of the child data, even though they may not have different information statuses from the adult point of view.

Table 1 represents children's use of definiteness distinctions (in columns) according to the information status of the referent (in rows). The Definite category encompasses both definite NPs and clitics⁸.

⁶For instance, since unique identifiability of a referent is relevant in most contexts, use of an indefinite article, which is consistent with all statuses, typically implicates non-unique identifiability (hence also non-familiarity). This implicature does not arise, however, if the identity of the referent is irrelevant to the message conveyed, as in (i).

⁽i) I came with a horse. (Uttered in a context where the horse is familiar to the addressee and hence also uniquely identifiable for the addressee)

⁷Note that the use of a demonstrative to encode mere referential status (i.e. the second level on the Givenness Hierarchy) is not licit in French. In French, demonstratives can only be used upon first mention if their referent can be identified deictically.

⁸Clitics would be classified as pronouns in the Givenness Hiearchy.

Table 1: Definiteness according to newness distinctions, by age groups							
		inites		Inde	finites	Total	
	NPs	Clitics					
GROUP A (2;6-3;3)							
Story-new, picture-new	21	0	17%	101	83%	122	
Story-old, picture-new	65	5	50%	70	50 %	140	
Story-old, picture-old	9	52	100%	0	0%	61	
GROUP B (3;5-4;5)							
Story-new, picture-new	15	1	12%	114	88%	130	
Story-old, picture-new	93	8	70%	43	30%	144	
Story-old, picture-old	14	66	100%	0	0%	80	
GROUP C (4;6-5;6)							
Story-new, picture-new	11	0	5%	213	95%	224	
Story-old, picture-new	130	21	83%	32	17%	183	
Story-old, picture-old	31	96	100%	0	0%	127	

A first important observation is that, in spite of the 'errors' (in bold), the use of definiteness to encode information status is not at all random. In the clearest cases (first mention in the story vs. subsequent mentions in a given picture), children's performance is close to target-like: they overwhelmingly chose indefinites for new information (row 1) and definites for available information (row 3). In each age group, there is a statistically significant difference between the use of definites vs. indefinites depending on the newness status of the referent.⁹ This tallies with Allen (2007) and Serratrice (2008b), who both observe that from at least 2 (Allen) or 3;3 (Serratrice) years of age, children are sensitive to the previous mention of referents.

Few "egocentric" errors are found in this elicitation task, even in the youngest age groups. Typical examples are given below:

(3) Context: Second picture of the story. Represents a hen (previously introduced) and a dog (new).

 $^{^9\}mathrm{This}$ is true in all cases, i.e. whether the two 'old information' categories are collapsed (as they should be in the adult language) or whether they are kept separate. Fisher exact test with collapsed categories (new vs. old): p<2.2e-16 for each age group; Pearson's Chi-squared test with the 3 categories in Table 1 (new vs. story-old, picture-new vs. story-old, picture-old): p<2.2e-16.

(4) Context: The child has just turned to the third picture, which shows the hen and dog (previously introduced) and a sheep on a bike (new).

Il y a le mouton ## et le chien et la poule. ¹¹ (5;5.25) It there has the sheep and the dog and the hen 'There's the sheep, and the dog and the hen.'

As shown in Table 1, only 17% (21/122) of new referents were introduced with a definite noun phrase in Group A, and this proportion appears to drop down gradually to 5% (11/224) in Group C. This is a much lower error rate than has been found in other studies, where it is as high as 54% (Warden, 1976) or even 62% (Karmiloff-Smith, 1979) in 3-year-olds. An explanation for the residual errors is however still needed. The hypothesis entertained here is that children who do not yet understand that seeing leads to knowing will not be able to appreciate that their blindfolded addressee does not have access to the relevant visual information, and are therefore likely to overuse definites to encode new referents.

4. The impact of Theory of Mind

4.1. Results from the Theory of Mind test

There were two sets of conditions: one controlling for the perspective of the puppet (Puppet-Seen condition vs. Puppet-Not-Seen condition) and one controlling for the perspective of the child (Child-Seen condition vs. Child-Not-Seen condition). The two experimental questions probed the child's evaluation

¹⁰The ages are given in years;months.days.

 $^{^{11}}$ ## indicates a short pause.

¹²Lower rates more similar to what was found here are reported for 3-year-olds in Schafer and de Villiers (2000): 14%, Emslie and Stevenson (1981): 16%, Maratsos (1974): 17%. See De Cat (2011) for a detailed review.

of the puppet's perspective (has it looked inside the box) and knowledge state (does it know what is in the box).

The results are summarised in Table 2.¹³ Age groups were defined on a 6-month interval. However, as there was no difference between groups from the age of 4 onwards, data for these children were collapsed into one larger group.

¹³Four children had to be excluded from the analysis because of experimenter error or, in one instance, because that child systematically gave the wrong answer (in a very confident manner), while the rest of his age group's performance was error-free (he was 5;4.12).

Age 1 (younger than 3) N = 7

Perspective			Child's judgement						
Child	Puppet	Puppet has seen		Puppet has seen		Puppet has seen		Pu	ppet knows
Not seen	Not seen	4	57%	1	14%				
	Seen	7	100%	7	100%				
Seen	Not seen	4	57%	2	29%				
	Seen	6	86%	6	86%				

Age 2 (3-3:5) N = 6

Perspective			Child's judgement				
Child	Puppet	Puppet has seen		Puj	ppet knows		
Not seen	Not seen	3	50%	3	50%		
	Seen	6	100%	4	67%		
Seen	Not seen	4	67%	3	50%		
	Seen	6	100%	6	100%		

Age 3 (3:6-3:11) N = 6

Perspective			Child's judgement				
Child	Puppet	Puppet has seen		Pu	ppet knows		
Not seen	Not seen	6	100%	0	0%		
	Seen	6	100%	5	83%		
Seen	Not seen	6	100%	1	17%		
	Seen	6	100%	4	67%		

Age 4 (older than 4) N = 20

	1180 1 (01401 011011 1) 1							
Persp	ective	Child's judgement						
Child	Puppet	Pup	opet has seen	Pup	pet knows			
Not seen	Not seen	20	100%	19	95%			
	Seen	20	100%	20	100%			
Seen	Not seen	19	95%	20	100%			
	Seen	19	100%	20	100%			

Table 2: Proportion of children judging accurately the puppet's perspective and knowledge state, by age group

All the children could correctly judge whether the puppet had looked inside the box when it actually had. 14 From 3;6, all children could correctly make that judgement about the puppet when it had not looked inside the box. 15 Before

 $^{^{14}\}mathrm{One}$ item only was an exception to this: one child at Age 1 provided the wrong answer in one condition ("Puppet Seen - Child Seen"), but answered correctly in the other condition ("Puppet Seen - Child Not Seen").

15 There was also one exception to this, from a child aged 5;5.25 who otherwise answered

3;6, only two thirds of the children managed to do so.

A more gradual developmental effect is observed in the ability to evaluate the knowledge state of the puppet. Most of the children in all age groups correctly evaluated the puppet's knowledge state when both the puppet and themselves had looked inside the box.

Before the age of 4, performance was generally good in the "Puppet Seen" condition (with 67 to 100% correct responses) even if the child had not looked inside the box themselves.

The third age group deserves special attention. All the children in that group were able to evaluate whether the puppet's perspective (i.e. whether it had looked inside the box), but most of them misjudged the puppet's knowledge state in the "Puppet Not Seen" condition (with at most 17% correct responses). This represents an apparent regression compared with the previous age group.¹⁶

Age group	Passers
Under 3	0/7
3-3;5	2/6
3;6-3;11	0/6
4 and above	18/20

Table 3: Theory of Mind passers, by age group

After the age of 4, 90% of the children (18/20) answered correctly in all conditions, ¹⁷ indicating that they can make an accurate explicit judgement regarding the knowledge state of both puppets, irrespective of their own knowledge state. Before the age of 4, only 11% of the children (2/20) passed the test in both conditions. These results are consistent with the widely reported finding that 4 is the age at which children master false belief, the definite test of mental-state understanding (Wellman, Cross, and Watson, 2001; Doherty, 2009).

I tentatively propose to distinguish three stages of ToM development based

correctly on all the other questions.

¹⁶The possibility that this could be due to a sampling effect can however not be discarded, given the very small size of each group.

¹⁷The apparent divergence with the results reported in Table 2 arises from the fact that the errors reported there were not all committed by the same children.

on this test.¹⁸ They are summarised in Table 4. At Stage 1, children are not fully able to evaluate perspective: they cannot reliably evaluate whether the puppet has seen what was in the box (based on whether it looked inside or not). At Stage 2, children can evaluate perspective but not others' knowledge state. At Stage 3, they can evaluate the knowledge state of another 'person' but only if they have witnessed that 'person' accessing the information visually. At Stage 4, children can evaluate another's perspective an knowledge state. The small number of children in Stage 2 may indicate that it is not distinct from Stage 1 (at least in this sample). The two were collapsed in subsequent analyses (see next section).¹⁹

	Correct evalu	uation of		Number of
	Perspective	Kn	children	
Stage		Puppet Seen	Puppet Not Seen	
1	Х	Х	Х	6
2	✓	X	×	2
3	✓	✓	×	10
4	✓	✓	✓	22

Table 4: Tentative Theory of Mind stages

It is important to note that the test used here tapped into explicit knowledge, as children were asked to emit verbal judgements about perspective and knowledge state. An implicit understanding of perspective (and possibly knowledge state) must be in place early on, as children have been shown to be sensitive to eye movement (in absence of other clues) from approximately 18 months of age (Moore and Corkum, 1998). What an implicit understanding consists of exactly is a matter of debate, but I will assume with Doherty (2009) that, in spite of being too rudimentory and/or not available to all parts of the cognitive system, that basic level of understanding can influence children's behaviour. A perceptual understanding of attention appears to be in place before an explicit

¹⁸The need for a more fine-grained distinction than simply between strict passers (answering correctly in all conditions) and failers will become clear in the next section.

¹⁹The effect of the child's own perspective is not taken into account in the tenative stages above because its effect was far less clear in the present experiment. It may be confounded with the effect of the puppet's perspective. Further work will be required to disentangle them.

understanding of it. For instance, $2^{1/2}$ old children have been shown to have an implicit understanding of what people have and have not seen (O'Neill, 1996), implying a rudimentary understanding of knowledge. Children have also been shown to omit more referents (i.e. produce more elliptical forms) in the presence of joint attention with their interlocutor already at the age of 2 (Skarabela, 2007).

Stage 3 seems to coincide with the emergence of the ability to make *explicit* judgements about perspective (Masangkay, McCluskey, McIntyre, Sims-Knight, Vaughn, and Flavell, 1974), and the emerging ability to *implicitly* understand false beliefs (Clements and Perner, 1994). Stage 4 seems to coincide with the emergence of the mental state understanding of attention, when children start to *show* understanding of belief and become able to make judgements based on their representation of facts (Clements and Perner, 1994).

4.2. Can egocentric errors be explained in terms of Theory of Mind?

The most conservative way of addressing this question is to see whether children continue to produce egocentric errors after they have passed the strictest version of the ToM test, which required them to answer all questions correctly in the ToM experiment. The relevant data is presented in Table 5, where egocentric errors are highlighted in grey.

Table 5: Egocentric errors in ToM failers vs. passers definites indefinites						
	NPs	clitics				
ToM failers						
Story-new, picture-new	21	0	23%	72	77%	93
ToM passers						
Story-new, picture-new	19	1	8%	230	92%	250

The presence of a statistically significant difference between the performance of the two groups (Chi-square, Chi= 13.69, p= .0002) could be taken to suggest that egocentric errors can be explained in terms of ToM. However, the fact that such errors continue to occur in clear ToM passers at a rate of 8% calls for closer scrutiny.

One possibility could be that, given that most ToM passers are above 4 years of age and that egocentric errors appear to decrease steadily across age groups (as seen in Table 1), the effect observed above could result simply from an age effect. A weak but significant correlation is indeed observed between age and the proportion of egocentric errors (Spearman Rank Order Corrlation $\rho = -0.1969$, p< .05), and a multiple regression analysis identifies age (p=.0487) but not ToM (p=.278) as significant factors explaining the distribution of egocentric errors (R=.34390556).

However, a breakdown according to the ToM development stages postulated in the previous section reveals an interesting pattern, obscured in the analyses above. As shown in Table 6, children at stage 3 commit a much higher proportion of egocentric errors than children at the other stages. A statistically significant difference obtains between the 3 groups (Chi-square= 270.2734, df= 2, p= .000000), but not between the Stage 1-2 group and the Stage 4 group (Chi-square= .10, p= .7462).

	definites			indefinites		total
	NPs	clitics				
Stages 1-2	5	0	7%	68	93%	73
Stage 3	21	0	28%	54	72%	75
Stage 4	19	1	8%	230	92%	250

Table 6: Egocentric errors by ToM stages

Individual inspection of results reveals that the significant rise in egocentric errors at Stage 3 is due essentially to 3 children, who commit egocentric errors between 60% and 78% of the time, compared with a maximum error rate of 17% in the other seven children of that group. Two of the youngest children at Stage 4 also produce exceptionally high proportions of egocentric errors (30% and 50% respectively, compared to 0 to 17% in the rest of that group). So between the ages of 2;11 and 4;1 (but not before and not after that), and only if they are at Stage 3 or early Stage 4, some children appear particularly confused

in their choice of definiteness distinctions to encode referent newness.²⁰ This seems to tally with the apparent regression in ToM scores observed between Stage 2 and Stage 3 (as seen in the previous section), a point at which children were speculated to start developing an explicit understanding of perspective and an implicit understanding of false beliefs.

To summarise, this study does not reveal a straightforward correlation between Theory of Mind development and egocentric errors. However, it would be too strong to conclude that Theory of Mind does not have any effect: it appears that some children are particularly prone to egocentric errors when the nature of their understanding of perspective starts becoming explicit (around 3;6 to 4 years of age). Further work will be needed to determine whether what is compromised at that point is children's ability to monitor their listener's perspective, or their ability to recruit this knowledge for other cognitive tasks (such as definiteness choices).

5. Alternative explanations

van Hout et al. (2010) propose an analysis of definiteness choice within the Optionality Theory framework. They explain the-overuse in production by the target-deviant ranking of two markedness constraints: Determined Reference (a universal constraint favouring article systems without definites) and Avoid Indefinites (the highest in a hierarchy of referential economy constraints that makes speakers prefer less costly forms such as pronouns). Children who (incorrectly) rank Avoid Indefinites over Determined Reference are expected to produce the across the board, while children who have not yet ranked the constraints are predicted to use a/the at random. The correct ranking is arrived at as a readjustment following instances of miscommunication. None of the children in the present study produced definites across the board, and most children produced only a very small proportion of egocentric errors rather than

 $^{^{20}\}mathrm{The}$ particularly high rates of egocentric errors reported in the literature also seem confined to that age group, as in e.g. the studies by Warden 1976 and Emslie and Stevenson 1981 — see Section 1.

a pattern of random choice between definites and indefinites, so target-deviant ranking of constraints isn't sufficient to explain the results.

van Hout et al. (2010) invoke two further sources of difficulties for children, although these are argued to apply to comprehension only (and not production). (i) Children are argued to rely on the visual context rather than the discourse context to disambiguate reference (van Hout et al., 2010, 1982). The extent to which this could explain the present results will be discussed below. The other additional source of difficulty (ii) is attributed to children's inability to consider their interlocutor's perspective and compare it with their own in order to evaluate the informativeness of indefinites. As the most costly form, an indefinite should only be used for non-familiar referents. Evaluating this requires "scalar implicature reasoning with the Gricean maxims of informativity" (van Hout et al., 2010, 1978), something that is notoriously difficult for young children. It is unclear why such reasoning should not be required to make definiteness choices in production, as advocated for instance by Gundel (2009).

Gundel (2009) argues that the appropriate use of referring expressions depends on (i) the ability to assess the cognitive state of the addressee and (ii) the ability to assess the amount of information that is sufficient and relevant. She postulates that only the former is implicit and relatively automatic, and in place at an early age in children (i.e. before the age of 3). The latter ability is said to require a certain level of conscious reasoning requiring further ToM development, which explains why children older than 3 overuse demonstratives. This is because their inability to calculate quantity implicatures at that age makes them use forms with too high a cognitive status (such as demonstratives in contexts where a simple definite form would be sufficient). They fail to appreciate that it is sufficient to mark the referent as uniquely identifiable (on the Givenness Hierarchy repeated below in (5)) to allow the required interpretation.

(5)

Egocentric errors, i.e. using of a definite article when the referent is not uniquely identifiable by the addressee, are not predicted by Gundel's account. Even before the age of 3, children are assumed to have the ability to assess the cognitive state of their addressee. Beyond the age of 3, the only type of error predicted is that which arises from the calculation of quantity implicatures. Such implicatures do not play a role in the choice between a definite and an indefinite expression when the referent is not uniquely identifiable by the addressee. In that case, the highest licit givenness status is that of referential (expressed in French by an indefinite). Using a definite in such a context does not amount to being over-informative. It is not an error in relevance-driven pragmatic inference, but an error involving the Givenness Hierarchy (i.e. an error involving the procedural information about cognitive status encoded by the definite article). Does this imply that residual egocentric errors beyond the age of 3 are due to children's *inability* to assess the cognitive state of the addressee? The very fact that these are residual errors, i.e. marginal among otherwise target-like performance, suggests the opposite. How can the two be reconciled?

As pointed out earlier, the only study reporting a total absence of egocentric errors is that of Schafer and de Villiers (2000). The key factor in their design seems to be that they didn't use any visual support to prompt the children. Instead, in the relevant condition, they questioned the children about their own world (clearly unknown to the interviewer). While the children tested were slightly older than that of e.g. Schaeffer and Matthewson (2005), they were still well within the age range of other studies reporting a high proportion of egocentric errors, such as Warden (1976); Maratsos (1974); Karmiloff-Smith (1979), etc. A very likely explanation is that egocentric errors could be due principally to children's over-reliance on deixis as a source of mutual knowledge

to license definites upon first mention.²¹

The variation in children's performance across studies supports the hypothesis that the choice of task had a significant impact. In the present design, great care was taken to avoid the possible licensing of definites upon first mention (such as in (6), (7)) which may partly explain the relative improvement in performance compared with other studies. However, the use of images as prompts still resulted in a small proportion of egocentric errors.

- (6) 'She's bored so she decides to go on the beach.' (Unique referent)
- (7) I'm reading a great book but I can't remember who the author is. (Bridging)

Children's reliance on the visual context manifests itself in different ways. For instance, in the present study, the youngest group uttered many fragments (i.e. verbless utterances consisting in a single constituent, as in (8)), which rendered their stories difficult to interpret without the aid of the pictures (something also reported by e.g. Hickmann 2003).

(8) Oh un mouton! oh a sheep 'Oh, a sheep!'

The egocentric errors discussed above are another manifestation of this (probably unconscious) tendency to rely on their addressee to recover background information from the visual context. Over the age of 4, when they should in principle be able to fully understand that their interlocutor cannot see the pictures, some children continue to rely on deixis to license a small proportion of definites on first mention. In other words, they *can* at that age consciously

²¹In the Schaeffer and Matthewson (2005) study, the puppet prompting the child did actually 'see' everything the child saw, which increased the common ground and automatically licensed definite uses when the experimenters wanted to rule them out. The design also relied on the child understanding and taking into account that the puppet didn't really listen or understand. This might have been too demanding a cognitive requirement on such young children.

monitor their listener's perspective and knowledge state, but they still fail to do so some of the time, especially when the nature of their understanding of perspective begins to change (i.e. between Stage 3 and Stage 4 as defined in Section 4.1). Joint attention between themselves and their interlocutor (in spite of the blindfold, as both participants were focusing on the story in the book), is likely to have had an effect, reinforcing children's assumption of shared perspective. Young children tend to assume that their addressee will perceive as salient what is salient for themselves. This might be exacerbated in a story-telling setting, especially when looking together at a book. In the present design, this tendendy manifested itself especially with respect to main characters on pictures.²²

Insufficient monitoring of others' perspective or knowledge state is however by no means unique to children. Adults (some more than others) do also sometime misevaluate the salience of what they are talking about. And this usually leads to minor conversation breakdowns, as in (9).

- (9) A: She's gone now.
 - B: Who's gone?

Anderson and Boyle (1994) for instance have shown that adults sometimes use definites to introduce referents which they know to be visible to themselves only and not to their interlocutor.

Recent research has revealed that adults in fact do not systematically ascribe beliefs to others: they monitor others' knowledge state only if explicitly required to do so (Apperly, Riggs, Simpson, Chiavarino, and Samson, 2006). Adults have even been claimed not to be less egocentric than children when assessing other people's perspective (Epley, Morewedge, and Keysar, 2004). The essential difference lies in adults' ability to correct an initial egocentric interpretation (Epley et al., 2004, 766).

 $^{^{22}}$ This is consistent with the findings of Skarabela (2007), who argues that joint attention has an influence on (2;0-3;6 year-old) children's choices of arguments and that children evaluate the accessibility of referents based on their listener's attentional state.

As suggested by Serratrice (2008a), children's insufficient monitoring of their interlocutor's knowledge state could be better understood within the model of dialogue of Pickering and Garrod (2004). According to that model, if speaker and hearer have similar representations of a situation, they do not need to keep monitoring the other's mind. Alignment between interlocutors' perspective arises from the automatic build-up of an implicit common ground, which does not derive from the modelling of each other's belief (Pickering and Garrod, 2004, 178). Realignment with active monitoring is only required if the speaker detects signals indicating that the listener cannot straightforwardly interpret the input and that a rectification based on the speaker's own representation is insufficient to repair the breakdown.

6. Conclusion

Egocentric errors arise when the child uses a definite to encode a new, non-unique referent. Children's generally target-like performance in our experiment concurs with other studies (De Cat, 2009; Gundel, 2011) in indicating that the linguistic basis of discourse competence (viz. knowledge of the rules governing definiteness choices according to referent givenness) is in place before Theory of Mind is fully developed. That being said, no correlation was found between egocentric errors and the explicit awareness that seeing leads to knowing (a key milestone in Theory of Mind development). What causes children to overuse definites to encode new information in a small number of cases seems to arise from the combined effect of (i) a general tendency to assume a wider implicit common ground than adults would, especially when the situation allows reliance on the visual context as main domain of reference and (ii) a temporary difficulty in monitoring their addressee's perspective (possibly due to the change in nature of their understanding of perspective). The latter will need to be investigated in further research.

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