ACQUIRING EPISTEMIC MODAL AUXILIARIES: THE ROLE OF THEORY OF MIND*

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Abstract
This study considers the acquisition of epistemic modal auxiliaries (EMA) in typically developing (TD) and autistic children and the role that Theory of Mind (ToM) plays in this development. Nineteen Dutch-speaking TD children and ten autistic children received tasks assessing ToM, general linguistic ability and EMA comprehension. Results suggest that both groups have some understanding of the Dutch EMA system, but no significant differences were found between groups. However, once participants were divided into ToM passers and ToM failers irrespective of clinical diagnosis, results showed that passers performed significantly better than failers on EMA understanding. Having a good understanding of others' mental states, as evidenced by full marks on ToM tasks, thus seems important in the acquisition of EMA.

Keywords: epistemic modality, Theory of Mind, word learning, autism

1. Introduction

If we assume that an average English-speaking adult knows around 60,000 words and that children start to learn words around their first birthday, this means that the child has to learn an average of around 10 new words a day every day until she reaches adulthood (Bloom, 2000, 2002). Exactly how children are capable of this stunning accomplishment is not entirely clear, but many researchers agree that children's understanding of other people's intentions is a fundamental part of the word learning process (Baldwin, 1993; Baldwin & Moses, 2001; de Villiers, 2007; Happé & Loth, 2002). The aim of this paper is to investigate to what extent the

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development of Theory of Mind (ToM), the ability to explicitly reason about others' (potentially false) beliefs (Perner, Leekam & Wimmer, 1987), is related to the child's understanding of epistemic modal auxiliaries (e.g. must, might, may) that refer to an understanding of the speaker's belief for their interpretation.

1.1. Theory of Mind and the acquisition of epistemic modal auxiliaries

Epistemic modal auxiliaries such as the italicised words in 1) and 2) relate to how strongly the speaker is committed to the truth of a proposition. In other words: what degree of belief the speaker has in her utterance (Papafragou, 1998).

(1) The keys *must* be in the drawer
(2) It *may* be raining

In Example 1), use of the modal auxiliary 'must' indicates that the speaker is very certain of the location of the keys and hence strongly believes they are in the drawer; use of 'may', on the other hand, indicates a considerably less strong belief in the truth of the statement.

Various studies have looked at young children's understanding of modal auxiliaries. Hirst and Weil (1982), for instance, considered three- to six-year-old children's understanding of the modals 'must', 'may' and 'should' and found that only the oldest children (starting at 5;6) could make strength distinctions between the modals, a result that was replicated in a more recent study by Noveck, Ho and Sera (1996). Similarly, in Moore, Pure and Furrow (1990)'s study of the epistemic modal auxiliaries 'must', 'might' and 'could', even the oldest children (six-year-olds) did not demonstrate ceiling performance, although this study did find significant improvement in the understanding of these terms between the ages of three and four. Studies assessing comprehension of epistemic modal auxiliaries in English-speaking children thus generally find basic comprehension of these terms when children are around five years old. The few studies that have been conducted with children acquiring languages other than English point to a similar age of acquisition range. For instance, De Mulder (2015) demonstrates that Dutch-speaking four- and five-year-olds have some understanding of the contrasts between the Dutch modal auxiliaries *moeten* 'must be' and *kunnen* 'may be', although the five-year-olds did not yet demonstrate ceiling performance. However, Bascelli and Barbieri's (2002) study on the Italian modal auxiliaries *dovere* 'must' and *potere* 'may' found a somewhat later age of acquisition as basic comprehension was only present in six-year-olds, with development still continuing in eight-year-olds.

These studies thus suggest that a dawning understanding of epistemic modals begins at around four years old with development continuing for at least a number of years more. Given how understanding of these terms would seem to rely on the child's capacity to understand 'the mind behind the speech', one factor that might be important in the acquisition of these vocabulary items is the child's ToM

development. A number of previous studies have considered whether there is a relationship between the acquisition of 'mental' areas of language and the development of ToM. Moore et al. (1990), for example, looked at four-year-olds' understanding of both mental state verbs ('know' and 'think') and modal auxiliaries ('must' and 'might') and demonstrated that the children's understanding of the mental terms was related to their understanding of beliefs. Similarly, De Mulder (2015) found an association between the understanding of mental state verbs, modal auxiliaries and modal adjuncts and ToM development in typically developing Dutch-speaking four- and five-year-olds. Furthermore, Papafragou (2001), Papafragou and Li (2001) and Ifantidou (2005) have all argued that children's acquisition of evidential markers (the linguistic encoding of information source), is constrained by the development of ToM, in particular the understanding of the source of beliefs and speaker certainty.

1.2. Acquiring mental state terms when ToM development is impaired

Although previous research thus suggests that there is a relationship between the development of mental areas of language and the child's ToM development in typically developing children, the existence of this relationship would be more robustly supported by demonstrating that impairment in ToM development is associated with an impairment in mental language development. In this sense then, it is insightful to consider to what extent the development of mental language in autistic children is comparable to that of typically developing children. It is generally assumed that many autistic children are specifically impaired in their ability to appreciate the mental states of others (Baron-Cohen, Leslie & Frith, 1985; Frith, 2003; Leslie & Thaiss, 1992; Yirmiya, Erel, Shaked & Solomonica-Levi, 1998). They typically fail to take into account the speaker's focus of attention when she utters a novel word, leading to problems in lexical acquisition (Baron-Cohen, Baldwin & Crowson, 1997) and, when they are older, they also tend to fail standard ToM tasks that typically developing children start to pass at around four years old. If autistic children thus show a delay or impairment in their understanding of mental language as compared to typically developing children, this would support the suggestion that children rely on their understanding of beliefs in order to fully understand vocabulary items that relate to mental states. Following this line of reasoning, various studies have investigated the development of mental language in individuals with autism. Ziatas, Durkin and Pratt (1998), for instance, considered the development of the mental state verbs 'know', 'think' and 'guess' in relation to false belief understanding and found autistic children to perform significantly worse than typically developing children. This finding is consistent with various other studies. For instance, Tager-Flusberg (1992) demonstrates that autistic children use significantly less cognitive mental state language in comparison to language-matched children with Down syndrome, Baron-Cohen et al. (1994) suggest that autistic children are impaired in their recognition of mental state terms as compared to mentally handicapped children

and Kazak, Collis and Lewis' (1997) found that autistic children were impaired in their ability to understand the mental state terms 'know' and 'guess'.

It should be noted, however, that not all studies that have investigated mental language use in autistic populations have found deficits. The four high-functioning Dutch-speaking autistic adults assessed in De Roeck and Nuyts (1994, cited in Papafragou, 2002), for instance, displayed typical use of three markers of epistemic modality in their spontaneous speech (the adjective/adverb *waarschijnlijk* 'probable' or 'probably', the mental state verb *denken* 'think' and the modal auxiliary *kunnen* 'can/may'). This finding suggests that at least certain autistic individuals may be able to acquire various domains of mental language. However, De Roeck and Nuyts' study does not mention performance on standard ToM tasks for these participants. Given the finding that high-functioning autistic individuals do tend to be able to pass standard ToM tasks at some point (Frith & Happé, 1994; Happé, 1993), it is possible that these adults actually have attained an understanding of others' beliefs that is sufficient for proficient mental state language use (see also Papafragou, 2002).

Although previous studies thus suggest that there is a relationship between ToM development and the comprehension of mental state language, additional studies that assess both ToM ability and mental state language understanding in autistic and typically developing children would be useful to determine what role ToM has to play in the development of mental language. The current study adds to previous studies in that the sample of autistic children is relatively young (six-year-olds) as compared to similar studies and their understanding of Dutch epistemic modal auxiliaries is investigated, whereas many other studies in this domain focus on English and mental state verbs. If, despite these differences, the current study also demonstrates that children with a ToM deficit show an impairment in their understanding of mental language, this would serve to underscore the importance of ToM development in the acquisition of mental state language.

2. Method

2.1. Participants

Nineteen Dutch-speaking typically developing children (11 girls and 8 boys) between ages 6;0 and 7;0 (M = 6;5 years) and ten Dutch-speaking autistic children (2 girls and 8 boys) between ages 5;1 and 8;4 (M = 6;11 years) participated in this study. The two groups did not differ significantly in age ($t(27) = -1.88$; $p = .18$). According to school records, all the children in the autistic group had been clinically diagnosed with a disorder in the autistic spectrum as assessed by medical specialists in the Netherlands using DSM-IV criteria (three children were diagnosed with PDD-NOS, seven with autistic disorder). The children in this group were all attending either special schools or special programmes within

regular schools catered to autistic children. Children in the autistic group were included in the study if they were aged between five and eight years old and if they were willing to participate. The autistic sample was recruited from four different schools; the typically developing children all came from one regular primary school. The teachers of the typically developing group reported that none of them had any identified disorders or impairments, nor was there any suspicion of possible disorders.

In order to be able to pinpoint a specific difference in mental language ability, it was important to ensure that the autistic and the typically developing children had comparable linguistic ability outside of the mental domain. To this end, two language tasks, testing receptive vocabulary and language comprehension at the sentential level, were incorporated in the assessment. Receptive vocabulary was assessed using the Dutch version of the Peabody Picture Vocabulary Test III (PPVT, Schlichting, 2005) and an abbreviated version of the Reynell test for language comprehension (van Eldik, Schlichting, lutje Spelberg, van der Meulen & van der Meulen, 1995) was employed to measure sentential language comprehension. Independent t-tests demonstrated that the autistic children were comparable to the typically developing children regarding language ability outside of the mental domain (vocabulary: $t(27) = -1.19$; $p = .25$; sentential language comprehension: $t(27) = -1.21$; $p = .24$).

2.2. Procedure

Children were tested individually in a separate room in their school building. For the typically developing children, two adults were present throughout the session. The data from the typically developing children was a subset of a larger dataset, approximately 30 minutes of which relates to the data presented in this paper. The autistic children received one session of approximately 30 minutes in which the data reported on here were gathered (some additional tasks were also included in this session, but are not reported on further). Children in the typically developing group received various different testing orders; children in the autistic group received a set order (ToM, vocabulary, understanding of modal terms and sentential language comprehension). For practical reasons, it was not possible to have two adults present for the autistic group, so only one experimenter conducted the testing for the autistic children. All children received stickers in return for their participation.

2.3. Materials

2.3.1. Epistemic modal auxiliaries

This task employed a test design very similar to the one used in Ziatas et al. (1998). Children were shown two boxes (one red, one blue) in which a sticker could be hidden. Two puppets gave the child information on the location of the sticker by using the Dutch epistemic modal auxiliaries *moeten* ‘must be’, *zullen* ‘shall be’

and *kunnen* 'may be' contrastively (see Example 3). To find the sticker, children had to prefer the box referred to by *moeten* ('must be') over the one referred to by *zullen* ('shall be') or *kunnen* ('may be') and the box referred to with *zullen* ('shall be') over the one with *kunnen* ('may be')[1].

(3) *De sticker moet/zal/kan wel*[2] *in de rode doos liggen*
The sticker must/shall/may [interjection] in the red box lie
'The sticker must/shall/may be in the red box'

In six trials each contrastive pair was used twice. Children were not allowed to look inside the boxes in between trials. Prior to the test trials, two practice trials were included in which one puppet stated simply where the sticker was (de sticker ligt in de rode doos, 'the sticker is in the red box') and the other puppet stated where the sticker was not (de sticker ligt niet in de blauwe doos, 'the sticker is not in the blue box'). The child received a sticker for each of the practice trials and was promised more stickers if she played the game and paid attention.

2.3.2. Theory of Mind

Two different types of false belief tasks were conducted (separated by an additional task that is not reported on further): a location change task (Wimmer & Perner, 1983) and an unexpected contents task (Perner et al., 1987). In the location change task, children were told a story in which a marble is initially placed in a blue box by a doll named Laura, but is later placed in a red box, unbeknownst to Laura. On Laura's return, the child is asked to predict and explain Laura's searching behaviour ('Where will Laura look for the marble?' and 'Why will she look there?'). A maximum of two points could be scored on this task. For the explanation question, answers were scored correct if they referred to the original location of the object or the character's belief regarding the location of the object. Two control questions pertaining to the first and the final location of the marble were also included to ensure that the child had understood the story and remembered the key events.

For the unexpected contents task, children were introduced to a new doll and told that he would like to play a game with them, but that he was too tired at the moment. The child was then shown a familiar container (an egg box) and asked what was in it. Once the expected answer had been given, the true contents of the box, a toy car, were shown. The box was then closed again and the child was asked three test questions: 'When you first saw the box, what did you say was in it?' (assessing the child's own false belief), 'What will the doll say is in this box when we ask him what's in it?' (assessing the doll's false belief) and 'Why will the doll

[1] 14 Dutch-speaking adults also completed this task and demonstrated that they performed at ceiling with a 96,8% accuracy rate. The difference in speaker certainty conveyed by the three modal terms used here is thus robust for adult speakers of Dutch.

[2] The interjection 'wel' doesn't add a specific meaning to the sentence, but it serves to make the whole sentence sound more natural.

say that?' (assessing their ability to explain the doll's false belief). It should be noted that none of the ToM questions contained mental state verbs, so that lack of understanding of these terms would not hinder performance. Three points could be scored for this task. Answers to the explanation question were scored correct if they referred to the box' misleading appearance or the doll's mistaken belief regarding the contents of the box. A control question pertaining to the actual contents of the box was included to ensure children had remembered this aspect of the story.

3. Results

Table 1 shows the descriptive statistics specified separately for the typically developing and the autistic children.

Table 1. Means, SD and ranges for TD (N = 19) and autistic (N = 10) groups

	Typically developing				Autistic		
	Mean	SD	Range		Mean	SD	Range
Age (months)	77	3.85	72 -84		83	11.63	61-100
ToM-LC	2	0	2		1.4	0.84	0-2
ToM-UC	2.58	0.77	1-3		1	1.16	0-3
ToM total	4.58	0.77	3-5		2.4	1.71	0-5
LC-Vocab	94.21	13.44	68-120		100.8	15.59	75-120
LC-Sent	24.47	2.67	19-28		26.3	5.54	14-33
Epistemic terms	4	1.41	2-6		3.7	0.68	3-5

Note. SD: Standard Deviation; TD: Typically Developing; ToM-LC: ToM location change; ToM-UC: ToM unexpected contents; LC-Vocab: Language Comprehension-Vocabulary; LC-Sent: Language Comprehension Sentential. Maximum scores: ToM location change = 2; ToM unexpected contents = 3; ToM total score = 5; no vocabulary maximum; Sentence comprehension = 34; Epistemic terms = 6

Children could receive a score of six for their understanding of epistemic modal auxiliaries, with a score of three indicating chance performance (children could choose between two boxes). Although, as expected, the autistic children scored significantly lower on the ToM tasks than the typically developing children ($t(27) = 4.76$; $p = .003$; $r = .68$)[3], unexpectedly, there was no significant difference between the two groups in their understanding of epistemic modal auxiliaries ($t(27) = 0.63$; $p = .45$). The typically developing children had a somewhat higher mean score than the autistic children (4 vs. 3.7 respectively), but this difference was not significant. Additional analyses demonstrated that both groups were performing better than would be expected on the basis of chance ($t(18) = 3.08$; p

[3] r indicates Pearson's correlation coefficient r as a measure of effect size. All reported effect sizes are larger than .50 indicating a large effect (see Field, 2005).

= .006; r = .59 for the typically developing children and $t(9) = 3.28$; p = .01; r = .74 for the autistic children). These results thus suggest that both groups of children have at least some understanding of the contrasts between the three different epistemic modal auxiliaries employed in this task, although scores were not yet at ceiling level, indicating that development in this domain is still in progress at six years old. Furthermore, the lack of difference in performance between the two groups suggests that the autistic children are not impaired in this domain of mental language ability as compared to typically developing children of the same age and general verbal ability.

While this result is initially surprising, an explanation may lie in the ToM performance of the children in both groups. As the ranges for the ToM total score demonstrate, not all typically developing children passed all the ToM tasks and not all the autistic children failed them. In fact, five out of 19 typically developing children did not answer all ToM questions correctly and one out of the ten autistic children did give the right answer to all ToM questions. This thus entailed that the initial assumption underlying this study (i.e., that the six-year-old autistic children would all display a marked ToM deficit, whereas the typically developing six-year-old children were expected to perform well on the ToM tasks), was not borne out by the data. Potentially then, if the children are divided into groups dependent on their performance on the ToM tasks, regardless of clinical diagnosis, lesser performance on ToM tasks would turn out to be related to problems in understanding epistemic modal auxiliaries. In order to consider this possibility, an additional analysis was thus conducted. In this analysis the performance of ToM 'passers', that is, the 15 children, 14 typically developing and one autistic (seven girls, eight boys), who scored five out of five on the ToM total score was compared to that of the ToM 'failers', the 14 children, five typically developing and nine autistic (six girls, eight boys), who scored less than five on the ToM total score. The descriptive statistics of these two groups are presented in Table 2.

Table 2. Means, SD and ranges for ToM passers (N = 15) and failers (N = 14)

	ToM passers				ToM failers		
	Mean	SD	Range		Mean	SD	Range
Age (months)	79	4.24	73 -86		80	10.46	61-100
ToM-LC	2	0	2		1.57	0.76	0-2
ToM-UC	3	0	3		1	0.88	0-2
ToM total	5	0	5		2.57	1.4	0-4
LC-Vocab	96.47	12.13	73-120		96.5	16.79	68-120
LC-Sent	25.07	3.22	19-31		25.14	4.66	14-33
Epistemic terms	4.53	1.13	3-6		3.21	0.89	2-5

Note. SD: Standard Deviation; ToM-LC: ToM location change; ToM-UC: ToM unexpected contents; LC-Vocab: Language Comprehension-Vocabulary; LC-Sent: Language Comprehension Sentential. Maximum scores: ToM location change = 2; ToM unexpected contents = 3; ToM total score = 5; no vocabulary maximum; Sentence comprehension = 34; Epistemic terms = 6

The ToM pass-fail criterion employed here has been used previously in the literature (e.g. Ding, Wellman, Wang, Fu & Lee, 2015) and was used in this study to clearly distinguish children with a well-developed and consistent ability to appreciate others' false beliefs from those with less advanced (although not necessarily absent) abilities in this domain. If those children with a more tenuous understanding of others' mental states are found to perform significantly worse on the epistemic modal auxiliary task than the ToM passers, provided they do not also perform worse on the measures of general linguistic ability, this would suggest that having a fully developed, explicit ToM might be an important component in coming to understand epistemic modal auxiliaries. In order to assess this possibility, the same analyses were conducted as reported for the comparison of the typically developing and autistic children. T-tests demonstrated that the ToM passers with their mean epistemic modal score of 4.53 were performing significantly above chance ($t(14) = 5.28$; $p < .000$; $r = .82$), whereas the ToM failers were not ($t(13) = .90$; $p = .39$). An independent t-test demonstrated that the difference in epistemic modal auxiliary understanding for these two groups was significant ($t(27) = -3.48$; $p = .002$; $r = .56$), suggesting that ToM passers had a better understanding of epistemic modals than ToM failers (see also Figure 1).

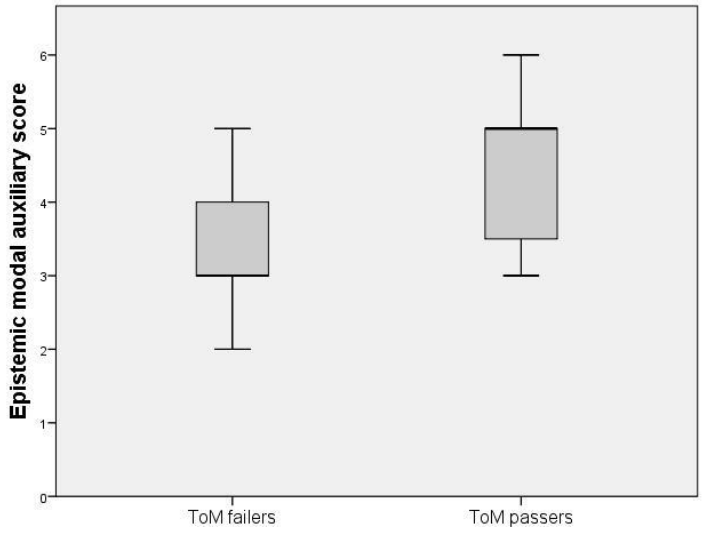

Figure 1. Distribution of epistemic modal auxiliary scores for ToM passers and failers

However, as the ToM passers and failers had not been matched on age and linguistic ability initially, the better performance on the epistemic modal auxiliary task of the ToM passers may simply be down to the ToM passers being older or generally more verbally able than the ToM failers. If the claim is to be made that it is specifically the child's ToM ability that plays an important role in understanding epistemic modal auxiliaries, it thus has to be demonstrated that the

ToM passers do not differ from the failers with regards to age or general linguistic ability. Independent t-tests demonstrated that this was indeed the case: there were no significant differences between the two groups regarding either age ($t(27) = 0.26$; $p = .80$) or general linguistic ability (vocabulary: $t(27) = 0.01$; $p = 1.00$; sentential language comprehension: $t(27) = 0.05$; $p = .96$). The ToM passers were thus not significantly older or more linguistically advanced in a general sense than the ToM failers.

4. Discussion

This study investigated the relationship between ToM and the understanding of epistemic modal auxiliaries in Dutch typically developing and autistic children. Given the finding from previous research that Dutch five-year-olds demonstrate a basic understanding of the Dutch epistemic modal auxiliary system (De Mulder, 2015), it was expected that the typically developing six-year-olds would be capable of understanding the strength distinctions between the various epistemic modal auxiliaries. This expectation was indeed borne out by the data: the typically developing six-year-olds showed above chance performance in their understanding of the epistemic terms. Furthermore, in line with Bascelli and Barbieri's (2002) findings suggesting that Italian children have not yet fully understood epistemic modal auxiliaries even at eight years old, the performance of the Dutch six-year-olds was not yet at ceiling level, suggesting that their understanding of the epistemic modal auxiliary system is still developing at this age.

Not all prior expectations were upheld by the findings of this study, however. Given results of previous research (e.g. Ziatas et al., 1998), it was hypothesised that the autistic children's ToM deficit would hinder them in their ability to acquire epistemic modal auxiliaries, thereby placing them at a disadvantage as compared to typically developing children of the same age. However, the results of this study showed a somewhat different picture. Although the typically developing children did outperform the autistic children on the ToM tasks, there was no significant difference in epistemic modal auxiliary understanding between the groups. This finding thus seems to go against the idea that ToM plays an important role in the acquisition of mental language. However, on closer inspection, it became clear that one autistic child was capable of answering all ToM questions correctly whereas five typically developing children were not. The initial assumption, that the autistic children would fail the ToM tasks and the typically developing children would pass them, thus proved to be false. In order to consider whether an advanced understanding of others' mental states (as evidenced by a full score on the ToM tasks), irrespective of clinical diagnosis, might be related to epistemic modal auxiliary understanding, the data were further analysed by considering the performance of ToM passers as compared to ToM failers. Indeed, if the children were divided according to performance on the ToM

tasks, the results showed the expected pattern: the ToM passers outperformed the failers in their understanding of epistemic modal auxiliaries. That this difference between the two groups was not just down to ToM passers' enhanced general cognitive ability is supported by the finding that the ToM passers and failers did not differ significantly in age or linguistic ability outside of the mental domain. Although, of course, it may be the case that these two groups did differ on measures in the linguistic or general cognitive domain that were not assessed in this study (e.g. conversational ability, Capps, Kehres & Sigman, 1998), the fact that these two groups did not differ significantly in their performance on either the receptive vocabulary or the sentence comprehension tasks suggests that the ToM passers are not just simply better at any demanding cognitive task than ToM failers. This finding thus suggests that the ability to demonstrate a consistent and explicit understanding of others' minds may be an important factor in developing an understanding of epistemic modal auxiliaries. After all, this is what distinguishes the ToM passers from the failers: those children who were capable of predicting and explaining another's false belief correctly and doing so consistently in more than one context (i.e. in both the change of location and unexpected contents scenarios) were the ones that demonstrated a higher level of epistemic modal auxiliary understanding. Although most of the ToM failers did display some understanding of others' beliefs (only two of the ToM failers, both autistic, received zero points for the ToM tasks, all other children had at least one false belief question correct), perhaps this more limited understanding of others' mental states does not help the child to the same extent in the acquisition of this domain of mental language. In this sense then, what might be relevant to the acquisition of vocabulary items that rely on an understanding of the mind is a relatively full appreciation of others' mental states, not just a dawning understanding.

In underscoring the importance of ToM development in the acquisition of mental language, these findings are thus in line with much of previous research (e.g. De Mulder, 2015; Ifantidou, 2005; Moore et al., 1990; Papafragou, 2001; Papafragou & Li, 2001). However, the fact that Ziatas et al. (1998), a study very comparable to the current study, obtained somewhat different results requires clarification. Whereas Ziatas et al. (1998) demonstrated that typically developing children outperformed autistic children in their understanding of mental state verbs, the current study did not find a significant difference in epistemic modal auxiliary understanding between the two groups. As both the sample size (12 autistic children in Ziatas et al. and 10 in the current study) and the number of autistic children passing ToM tasks (2 out of 12 in Ziatas et al. and 1 out of 10 in this study) were similar, these factors cannot explain the different outcomes. However, Ziatas et al. employed one ToM task in which the child only had to predict looking behaviour. In the current study, the children received two ToM tasks in which children had to predict and explain behaviour, thus providing a more stringent measure of ToM. The two autistic children that passed the ToM task in Ziatas et al. may thus not have counted as ToM passers had they been

assessed in this study. If this analysis is correct, the results of the current study and Ziatas et al. (1998) converge: children who have an advanced understanding of others' mental states outperform children with less developed ToM ability when it comes to the understanding of mental state language.

The results of this study thus point to the importance of explicit ToM development in the acquisition of mental language. This ability starts to develop from around four years old onwards, but, as this study demonstrates, even typically developing six-year-olds are not always capable of consistently articulating this understanding across different contexts (although all typically developing six-year-olds in this sample did display at least some understanding of false beliefs). However, this finding should not be taken to say that children under four have no understanding of false beliefs. Indeed, various studies have suggested that an implicit understanding of others' false beliefs may already be present in infants (e.g. Baillargeon, Scott & He, 2010). However, this knowledge is not explicitly available until many years later: children younger than four years old cannot call upon this knowledge consciously in order to answer questions that require an explicit response (which cannot be due only to verbal limitations, given young children's failure on nonverbal analogues of standard false belief tasks, see Call and Tomasello, 1999). The process by which understanding of others' mental states develops thus takes quite a number of years, with the development of explicit and consistent understanding extending until the child is at least around six years old. Potentially then, it is this advanced understanding that is important in helping the child on her way in solving the mental language part of the language acquisition puzzle.

Of course, it should be noted that this claim does not entail that the child's understanding of mental language may not also help her on her way in ToM development. Indeed, although previous research suggests that understanding other people's mental states affects the child's linguistic development, a number of studies have demonstrated that language development, particularly the acquisition of sentential complementation constructions involving mental state verbs like 'know' and 'think' (see de Villiers, 2005, 2007), plays an important role in ToM development (see Astington & Baird, 2005; Milligan, Astington & Dack, 2007). However, given that differences in epistemic modal auxiliary understanding were found to be related to ToM ability in two groups that did not differ in general linguistic ability, the current study does underscore the importance of having a well-developed, explicit ToM for the child to be able to understand epistemic modal auxiliaries.

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