# Clinical Pragmatics and Theory of Mind

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**Abstract** Theory of mind (ToM) describes the cognitive ability to attribute mental states both to one's own mind and to the minds of others. In recent years, ToM has been credited with playing a significant role in developmental and acquired pragmatic disorders. In this way, ToM deficits have been linked to pragmatic deficits in individuals with autism spectrum disorders (e.g. Martin and McDonald, *Journal of Autism and Developmental Disorders, 34*, 311–328, 2004), emotional and behavioural disorders (e.g. Buitelaar et al., *Development and Psychopathology, 11*, 39–58, 1999), intellectual disability (e.g. Cornish et al., *Journal of Intellectual Disability Research, 49*, 372–378, 2005), right-hemisphere damage (e.g. Winner et al., *Brain and Language, 62*, 89–106, 1998), schizophrenia (e.g. Brüne and Bodenstein, *Schizophrenia Research, 75*, 233–239, 2005), traumatic brain injury (e.g. McDonald and Flanagan, *Neuropsychology, 18*, 572–579, 2004) and neurodegenerative disorders such as Alzheimer's disease (e.g. Cuerva et al., *Neuropsychiatry, Neuropsychology, and Behavioral Neurology, 14*, 153–158, 2001). In this chapter, I examine the central role of ToM reasoning in utterance interpretation. The chapter addresses what is known about ToM development during childhood and adolescence as well as changes in ToM skills as part of the aging process. The role of ToM in developmental and acquired pragmatic disorders is discussed. The contribution of ToM research into pragmatic disorders is critically evaluated. Finally, several ToM theories are examined. The question is addressed of which, if any, of these theories is able to capture the pragmatic features of utterance interpretation.

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## 1 Introduction

The study of pragmatic disorders is an important area of work in the clinical communication sciences and an increasingly recognised sub-discipline within linguistic pragmatics (Cummings 2010, 2014a). This study, known as clinical pragmatics, has progressed to the point where certain trends or patterns are discernable. One of the most evident trends has been the pursuit of clinical studies of pragmatics simply because they can be done rather than because they are addressing theoretically significant questions. The lack of a theoretical rationale for many clinical studies has resulted in an abundance of research findings, a substantial number of which throw little light upon the disorders they purport to examine (Cummings 2005, 2007a, b, 2008, 2009, 2011, 2012a, b, 2014a). A recent counter-trend has been the attempt to explain pragmatic disorders in terms of underlying cognitive factors. This trend has largely developed in response to the observation that many populations in which there are marked impairments of pragmatics—adults who sustain a traumatic brain injury, for example—also exhibit significant cognitive deficits. Amongst the cognitive factors examined with respect to pragmatic disorders are deficits of executive functions such as planning and problem solving, visuospatial processing, the generation of inferences and a type of cognitive processing characterised by weak central coherence (see Chaps. 2 and 3 in Cummings 2009). Although studies of these cognitive factors are becoming increasingly common, one factor has received more investigation than all others. This is the ability to attribute mental states to the minds of others, and to use one's knowledge of these states to predict a person's behaviour, a cognitive skill which has become known by the term *theory of mind*. This chapter will examine this key cognitive skill and assess its role within pragmatic disorders in children and adults.

In the preface of their book *Understanding Other Minds*, Baron-Cohen et al. (2000) capture the main tenets of theory of mind (ToM). The developing child is involved in the construction of a theory about the contents of his own mind and the minds of others, a theory which is used to understand and predict the actions of those around him. These contents are none other than mental states such as beliefs, knowledge and desires:

> During the first few years of life, children acquire an understanding of the relations between their own mental states, the world (particularly, the social world), and action. They use this to understand themselves and others. Without obvious effort or formal instruction they learn that other people, just like themselves, have minds and that the behaviour of others, just like their own, reflects their knowledge, thoughts, beliefs, and desires. In the scientific literature, this has been called the child's acquisition of a 'theory of mind'. This term underlines the intellectual achievement of a theory upon which a child can rely (Baron-Cohen et al. 2000: v).

One mental state not mentioned by Baron-Cohen et al., but which is integral to pragmatic interpretation, is intentions. Since Grice set out in his William James Lectures at Harvard University to characterise the exchange of utterances between interlocutors in terms of the communicative intentions that motivate those

utterances, theorists have appreciated that pragmatic interpretation involves cognitive skills that are quite distinct from those employed during the linguistic decoding of utterances. Specifically, pragmatic interpretation requires an ability to establish the mental states, and particularly the communicative intentions, of other participants in communication. Even the briefest acquaintance with utterance interpretation reveals that this is the case. Imagine a scenario in which two friends, Jane and Mary, are having an evening meal together. Jane has spent all afternoon preparing a lamb stew. Mary does not like lamb but nevertheless forces herself to eat the serving of stew that Jane has put on her plate. When their meal is complete, Jane asks Mary 'Would you like more stew?', to which Mary replies 'I would like to leave room for dessert'. Of course, Mary is implicating that she does not want more stew. This implicature can only be recovered by Jane to the extent that she is able to make certain inferences about Mary's mental states. Jane must be able to infer, for example, that Mary believes, and believes that Jane believes, that in order to eat dessert, one must have some remaining appetite. As well as accounting for Jane's ability to recover the implicature of Mary's utterance, ToM also explains why Mary decides to use an implicature to refuse Jane's offer of more stew. It is because Mary conceives of Jane as an agent that can entertain mental states, specifically a range of feelings or emotions, that she decides to decline Jane's offer indirectly by means of an implicature, rather than by issuing the more direct, but less polite response, of 'No!'.

It emerges that pragmatic interpretation draws extensively on ToM skills. Yet, notwithstanding its significance to utterance interpretation, ToM remains a poorly characterised notion in relation to pragmatics in general and pragmatic disorders in particular. In reviewing what is known about the role of ToM in pragmatic disorders in this chapter, several related areas of ToM research must be addressed. To make sense of findings of ToM deficits in developmental pragmatic disorders in Sect. 4, something must be said about the trajectory taken by normally developing children on their way to acquiring a full theory of mind. Developmental studies of ToM have tended to focus on the transition that occurs between 3 and 4 years of age in normally developing children. This is a developmental period during which children move from experiencing failure on tests of false belief (a standard test of ToM) to achieving success on these tests for the first time at around 4 years of age. More recently, ToM research has been extended to examine maturation of ToM beyond the early years. In this way, there is now a small but growing number of studies which are charting ToM skills into adolescence and adulthood, and decline of ToM as part of the aging process. These various ToM developments will be examined in Sect. 3. ToM skills in adulthood and later life provide an important context in which to view findings of ToM deficits in acquired pragmatic disorders in Sect. 5. One of the impediments to an improved understanding of ToM in pragmatic disorders is the poor characterisations of ToM and pragmatic interpretation in clinical studies. We examine some of these characterisations in Sect. 6. Finally, theory of mind is itself the subject of intense theoretical deliberation. We examine theoretical proposals concerning the nature of ToM in Sect. 7. However,

we begin this chapter by saying something more about the role of ToM in utterance interpretation.

## 2 Theory of Mind in Utterance Interpretation

We have seen that in order to recover the implicature of an utterance, a hearer must be able to attribute mental states, specifically communicative intentions, to the speaker of an utterance. The hearer, who can establish these intentions, is able to determine what a speaker is attempting to communicate which, as we saw in Sect. 1, can be something quite different from what the speaker's utterance literally means. Implicature is not a unique pragmatic concept, however, with respect to the role played by ToM in its recovery. Consider the utterances in (1) to (5) below:

(1) Can you fetch my walking stick?
(2) I plan to leave for Paris tomorrow.
(3) John regretted leaving the team.
(4) Fran helped the old woman across the road. She was very grateful.
(5) What an architectural triumph! (uttered by a speaker upon seeing his son's tree house).

The speaker of the utterance in (1) is using an indirect speech act to request that the hearer fetch the walking stick. The hearer has little difficulty in establishing the illocutionary force of the speaker's utterance because he knows that the speaker knows that the hearer is indeed capable of fetching the stick—let's assume that the speaker and hearer are an elderly resident in a care home and a nurse, respectively. In such a case, the speaker is unlikely to be asking a question about the hearer's ability to fetch the stick. Rather, his utterance is more likely to be motivated by a mental state—a communicative intention—that takes the form of a request to the hearer to fetch the stick. The deictic expressions 'I' and 'tomorrow' in (2) also demonstrate the role of mental state attribution in utterance interpretation. To assign a referent to the pronoun 'I' (person deixis), the hearer must know who is the speaker of this utterance and must be able to attribute that knowledge both to his own mind and to the mind of the speaker. Similarly, the 24-hour period that is the referent of 'tomorrow' (temporal deixis) requires that the hearer attribute to the speaker knowledge of the 24 h henceforth and also possibly a calendar date. The speaker of the utterance in (3), which presupposes that John did leave the team, must also engage in mental state attribution. Specifically, the speaker must attribute to the hearer knowledge that John left the team, an action which the speaker then goes on to inform the hearer was a source of regret for John. Presupposition is a pragmatic mechanism whereby knowledge that is shared by speaker and hearer can be assumed in the asking of a question or the statement of an utterance. Yet, this is only possible in the current case to the extent that the speaker of (3) is aware of the hearer's knowledge of John and specifically the fact that John left the team.

ToM skills also play an important role in assigning a referent to the pronoun 'she' in the utterance in (4). Either of the preceding noun phrases 'Fran' and 'the old woman' is a potential referent of 'she'. What makes 'the old woman' the actual referent of this pronoun, the referent intended by the speaker, is a process of mental state attribution that proceeds as follows. The speaker of these utterances believes that the hearer believes that when a person receives the assistance of others, they usually express gratitude or appreciation. For his part, the hearer attributes similar beliefs and knowledge to the mind of the speaker. Based on their mutual knowledge of each other's mental states, the speaker can proceed to use the non-specific pronoun 'she' in the certain expectation that the hearer will assign to this term the referent intended by the speaker. The irony expressed by the utterance in (5) is only perceptible to a hearer who is both able to see the tree house in question and to make certain inferences about the speaker's mental states. Specifically, the hearer must infer that the speaker of this utterance believes that the tree house is a somewhat shambolic construction and, furthermore, that the hearer also believes this to be the case. The speaker must also be able to make similar inferences about the hearer's beliefs in order to be sure that his utterance will be understood as the ironic remark it is intended to be. The lesson to emerge from these examples is clear. Whether it is indirect speech acts, deictic expressions, presuppositions, pronoun reference assignment or irony, no account can be given of these key pragmatic notions in the absence of the involvement of ToM. This central idea will be returned to time and again in the following sections.

These examples can be used to demonstrate an important distinction in the mental representations that are the focus of ToM research. Some mental states that were attributed to speakers and hearers in the above examples concerned beliefs about events and states of affairs in the world, e.g. the belief that John had left the team in the utterance in (3). Other mental states that were attributed to the minds of the interlocutors in these examples were not beliefs about the world, but beliefs about an interlocutor's beliefs. These two types of mental state attribution highlight a key distinction between first-order and second-order mental representations, respectively. In utterance interpretation, a hearer must not only make inferences about a speaker's beliefs about the world (first-order ToM reasoning), but he must also make inferences about what the speaker believes about his (the hearer's) beliefs (second-order ToM reasoning). It was second-order ToM reasoning that Jane used to establish the implicature of Mary's utterance in Sect. 1, for example. The central role of second-order ToM reasoning in utterance interpretation presents the following challenge for ToM research. Most developmental studies of ToM have tended to focus on the transition that makes it possible for children to pass tests of false belief for the first time at around 4 years of age. However, these tests and the developmental maturation that they assess concern first-order ToM reasoning, typically an actor's false belief about the world. Given that utterance interpretation demands skills in second-order ToM reasoning, it would seem that developmental studies of ToM are failing to target the mentalising skills that are of most significance to the interpretation of utterances. This point is developed further in Sect. 30.2 of Cummings (2014b).

# 3 Normal Development and Theory of Mind

It has already been stated that normally developing four-year-olds pass tests of false belief, a developmental achievement which indicates that they are in possession of first-order ToM skills. False-belief tests have been at the centre of developmental and clinical studies of ToM. For this reason, the standard format of these tests will now be described. In an early study by Baron-Cohen et al. (1985), the type of scenario typically presented in these tests is characterised as follows:

> There were two doll protagonists, Sally and Anne. First, we checked that the children knew which doll was which (Naming Question). Sally first placed a marble into her basket. Then she left the scene, and the marble was transferred by Anne and hidden in her box. Then, when Sally returned, the experimenter asked the critical Belief Question: "Where will Sally look for her marble?". If the children point to the previous location of the marble, then they pass the Belief Question by appreciating the doll's now false belief. If however, they point to the marble's current location, then they fail the question by not taking into account the doll's belief. These conclusions are warranted if two control questions are answered correctly: "Where is the marble really?" (Reality Question); "Where was the marble in the beginning?" (Memory Question) (1985: 41).

Baron-Cohen et al. presented this scenario, which is an adaptation of Wimmer and Perner's (1983) puppet play paradigm, to three groups of children: 27 normally developing children (mean CA 4;5 years), 20 autistic children (mean CA 11;11 years), and 14 children with Down's syndrome (mean CA 10;11 years). Naming, Reality and Memory Questions were passed by all three groups of children. However, while 85 % of normal children and 86 % of children with Down's syndrome passed the Belief Question, 80 % of autistic children failed this question, a finding that was highly significant. The four autistic children who passed the Belief Question had chronological ages from 10;11 to 15;10 years. Clearly, the autistic children had a severe deficit in first-order mental state attribution which could not be accounted for by their reduced verbal and nonverbal mental ages (the verbal and nonverbal MAs of autistic subjects were higher than those of the Down's syndrome subjects in the study).

The ToM achievement of the normally developing children in Baron-Cohen et al.'s study is certainly one of the most significant findings in ToM research. However, it is preceded and followed by other ToM developments, about which much is now known. The ability to attribute beliefs and knowledge to the minds of others emerges after children have already acquired skills in manipulating a range of other mental states including desires, emotions and pretence. Ruffman et al. (2002) found that children's desire talk preceded their talk about beliefs. In a study of the reactions of toddlers aged 18–24 months to negative emotion displays, Jenkins et al. (1995) reported spontaneous comments by some children which indicated that they appreciated the emotional states of the actresses who participated in the displays. For example, during the sadness display, one child said 'lady not happy'. There is evidence that infants can appreciate pretence from around 15- or 16-months of age (Bosco et al. 2006; Onishi et al. 2007). It is now known that behaviours which first become evident in infancy serve as developmental

precursors to these early skills in recognising and attributing mental states. One such behaviour is joint attention. Charman et al. (2000) found that joint attention behaviours at 20 months were longitudinally associated with theory of mind ability at 44 months in a group of 13 infants. Similar findings are reported by Nelson et al. (2008) in a study of the joint engagement experiences of toddlers. Other factors which have been found to be facilitative of early ToM development include the presence of older siblings, maternal use of mental state language, ability to engage in fantasy and pretend play and early language skills (Ruffman et al. 1998, 2002; Adrián et al. 2007; Taylor and Carlson 1997; Watson et al. 2001).

Although normally developing children pass first-order ToM tasks for the first time around 4 years of age, younger children can also pass these tasks under certain conditions. Some of the conditions under which 3-year-olds can pass false belief tests include downplaying the salience of the real state of affairs or making salient the prior mental state of the actor in the scenario (both of which encourage the child to identify the actor's false belief), the child being actively engaged in deceiving the target person, overlearning the key features of the false belief narrative or phrasing the false belief question in certain ways (Wellman and Lagattuta 2000: 25). False belief performance can also deteriorate under certain conditions. Symons et al. (1997) found that the integration of caregiver figures into false belief location tasks did not result in the same age-related improvements in false belief performance that occurred during object identity and object location tasks. These investigators argued that the developing awareness of the minds of others in five-year-olds and the emotional content of the task may have interfered with false belief performance in the caregiver condition. Even amongst normally developing children, investigators have observed considerable individual differences in ToM development and performance on false belief tasks. Some of the factors that have been examined with a view to explaining these differences include a child's language ability and executive functions such as inhibitory control, planning ability and working memory capacity (Carlson and Moses 2001; Carlson et al. 2004; Hughes et al. 2005; Milligan et al. 2007; Mutter et al. 2006). With some exceptions, studies have revealed a correlation between ToM performance on the one hand and language ability and inhibitory control on the other hand.

ToM development in normally developing children beyond 4 years of age has been the focus of a growing number of studies. Liddle and Nettle (2006) examined higher-order recursive ToM skills in a group of 60 children who were 10 and 11 years of age. As expected, the children in this study mastered first- and second-order ToM problems. However, they performed slightly above chance on third-order problems and at chance on fourth-order problems. There is also evidence that further ToM developments take place in adolescence and even adulthood. Dumontheil et al. (2010) examined the development of ToM into adulthood by administering a computerised task to 177 female subjects in each of five age groups: Child I (7.3–9.7 years), Child II (9.8–11.4 years), Adolescent I (11.5–13.9 years), Adolescent II (14.0–17.7 years) and Adults (19.1–27.5 years). The task required participants to use the perspective of a 'director' and move only

those objects that the director could see. There was an improvement in the performance of this task between the Child I and Adolescent II age groups. Also, the Adolescent II group made more errors than the Adult group, suggesting that ToM use improves between late adolescence and adulthood. Even in adulthood, ToM skills do not remain static. There is now growing evidence that ToM skills undergo decline with increasing age (Pardini and Nichelli 2009; Sullivan and Ruffman 2004). Maylor et al. (2002) examined understanding of ToM stories in young, young-old and old-old age groups (mean ages 19, 67 and 81 years, respectively). The performance of the old-old age group on these stories was significantly worse than the other age groups across all conditions in the study (e.g. memory load present/absent). This age deficit remained significant even after measures of vocabulary and executive functioning, and processing speed were taken into account.

# 4 Developmental Pragmatic Disorders and Theory of Mind

Pragmatic disorders which have their onset in the developmental period have been the focus of considerable clinical investigation. Notwithstanding this intensive study, few general statements about the nature and extent of these disorders are possible. This is related in large part to the fact that the children who exhibit these disorders form a clinically heterogeneous group. It includes most notably children with an autism spectrum disorder, a neurodevelopmental disorder which has profound implications for the development of language in general, and pragmatic language skills in particular. Pragmatic impairments are also a feature of developmental language disorders such as specific language impairment. In some cases, these impairments appear to be secondary to deficits in structural language skills. But in at least one developmental language disorder—pragmatic language impairment—there is evidence that pragmatic impairment is primary in nature. Children who exhibit intellectual disability have difficulty acquiring the pragmatics of language. In some cases, this difficulty is commensurate with delays in acquiring phonological, syntactic and semantic aspects of language. In other cases, pragmatics is more or less impaired than aspects of structural language. Recently, investigators have begun to document the language and communication skills of children with emotional and behavioural disorders including attention deficit hyperactivity disorder, conduct disorder and selective mutism. Within this small, but growing area of clinical study, researchers have started to investigate the pragmatic disorders of these children. An examination of this as yet undeveloped area of clinical study will complete our survey of developmental pragmatic disorders.

Of course, a pragmatic disorder can result from a number of linguistic and cognitive factors which may act separately or in combination. A child with specific language impairment may be unable to produce indirect speech acts such as the utterance in (1) above because he or she lacks the requisite syntactic skills to

achieve inversion of the subject pronoun and auxiliary verb in this utterance. Alternatively, the child with poor impulse control may inappropriately initiate conversations or contribute utterances that overlap with the turns of others. While in the former case, a linguistic factor is central within the aetiology of the pragmatic disorder, in the latter case a cognitive factor predominates. The cognitive factor that will be examined alongside the pragmatic disorders in this section is theory of mind. As the discussion of Sect. 2 demonstrates, there is reason to believe that ToM will play a significant role within these disorders. However, we will see that the exact nature of that role is still somewhat difficult to determine on the basis of research that has been conducted to date. While studies have revealed significant associations or correlations between ToM functioning and various pragmatic skills, there is still considerable debate about what these correlations reveal. For example, rather than indicating a direct causal role for ToM in pragmatic disorders, these correlations may simply reflect the influence of a third variable (e.g. an executive function) on both ToM and pragmatics. This issue is raised, not with a view to addressing it in this chapter, but in the expectation that researchers in the area will increasingly regard it as a question of true theoretical significance. Certainly, discussions of the causal or other role of ToM in the impairments found autism are already well developed (see Chap. 4 in Cummings 2009).

The ToM and pragmatic impairments of children and adults with autism spectrum disorders (ASDs) have been extensively documented. In relation to ToM, studies have revealed that subjects with ASD display impaired understanding of the perception-knowledge relationship (Lind and Bowler 2010), have diminished awareness of their own and others' intentions (Williams and Happé 2010), and have impaired visual perspective taking (i.e. knowledge that different people may see the same thing differently at the same time) (Hamilton et al. 2009). Individuals with ASD also have difficulty inferring complex emotions and mental states in social contexts and from nonverbal social cues (Golan et al. 2008; David et al. 2010) as well as from faces and voices (Golan et al. 2006; Kleinman et al. 2001; Rutherford et al. 2002). An equally wide-ranging set of findings regarding the pragmatic skills of individuals with ASD is also available. Subjects with ASD have been found to have difficulty comprehending irony and metaphor (Gold et al. 2010; Martin and McDonald 2004), detecting violations of Grice's maxims (Surian et al. 1996), using features of context in utterance interpretation (Loukusa et al. 2007) and synchronising gestures with speech (de Marchena and Eigsti 2010). Conversational and discourse problems are also commonplace. Jones and Schwartz (2009) found that children with autism initiated fewer bids for interactions, commented less often, used fewer conversational turns to continue ongoing interactions and responded less often to communication bids than typically developing children during dinner conversations. Colle et al. (2008) found that adults with high-functioning autism or Asperger syndrome used fewer personal pronouns, temporal expressions and referential expressions than control subjects during narrative production.

The co-occurrence of ToM deficits and pragmatic impairments in subjects with ASD has led investigators to enquire if the former deficits might not be causally implicated in the pragmatic disorders of children and adults with ASD. This question assumes a particular direction in the relationship between ToM and pragmatics which, as Tager-Flusberg (2000: 128) has argued, is by no means universally accepted by investigators. Moreover, any prospect of meaningfully addressing this question demands an altogether more detailed developmental model of these two domains than is currently available, some 10 years on from when Tager-Flusberg identified the lack of such a model as an impediment to progress on this issue:

> …although all researchers agree that pragmatics are closely tied to theory of mind, the direction of this relationship has not been clearly delineated. Some argue that some understanding of mind is a prerequisite for acquiring language…or communication…Others suggest that through verbal interactions with others children come to understand that people have minds with contents different from their own…These positions may not be incompatible; what is needed is a more detailed *developmental model* of how different components of a theory of mind might be causally related at different points in time to specific aspects of pragmatics, communication, and discourse skills… (italics in original).

Until such times as a model of this type is forthcoming, it is difficult to assess the true import of the results of empirical studies that have examined the relationship between ToM and pragmatics in autism. Certainly, some studies have revealed significant associations or correlations between ToM and aspects of pragmatics in subjects with ASD. Martin and McDonald (2004) found that second-order ToM reasoning was significantly associated with the ability of subjects with Asperger's syndrome in their study to interpret non-literal utterances (ironic jokes). Hale and Tager-Flusberg (2005) examined discourse skills—specifically, the use of topic-related contingent utterances—and ToM in 57 autistic children. Over 1 year, autistic children made significant gains in the ability to maintain a topic of discourse. ToM contributed unique variance in the contingent discourse skills of these children beyond the significant contribution made by language skills. However, these correlations have not been replicated in other investigations. Losh and Capps (2003) examined the narrative discourse abilities of 28 high-functioning children with autism or Asperger's syndrome. These investigators found that the narrative abilities of these subjects were associated with performance on measures of emotional understanding, but not with ToM or verbal IQ. If the lack of a developmental model is impeding progress in addressing the question of the relationship between ToM and pragmatics in ASD, then investigators can surely receive little consolation from the somewhat inconsistent findings of the few empirical studies in the area. Clearly, more empirical and theoretical research must be undertaken if researchers are to succeed in representing the true nature of the relationship between ToM and pragmatics in ASD.

Children with developmental language disorder of unknown aetiology have received a number of diagnostic labels over the years, the most recent and widely accepted of which is specific language impairment (SLI). While the severe structural language deficits of these children may account for at least some of their

pragmatic deficits, the existence of a clinical subtype called pragmatic language impairment (PLI) attests to the fact that certain other pragmatic deficits are unrelated to these children's difficulties with linguistic structure.[1] Children with SLI and PLI have problems using context to understand implied meanings (Rinaldi 2000), produce inappropriate conversational responses (Bishop et al. 2000) and have difficulty manipulating inferences which play a role in pragmatic interpretation (Adams et al. 2009; Botting and Adams 2005; Ryder et al. 2008; Spanoudis et al. 2007). Alongside these pragmatic impairments, children with SLI have been found to have ToM-related deficits. Studies have shown, for example, that these children make less frequent use of cognitive state predicates than their mental age peers and exhibit delayed development of visual perspective taking (Johnston et al. 2001; Farrant et al. 2006). Children with SLI perform similarly to same-age peers on false belief tests when the linguistic complexity of these tests is low (Miller 2001). One linguistic feature in particular, the syntax of complement structures, has been found to predict false belief performance in children with SLI (Miller 2004). It is not difficult to see why this is the case. In order to attribute the false belief *Anne believes that the ball of wool is in the cupboard* to the mind of an actor in a false belief test, one must have some appreciation of the embedded clause *the ball of wool is in the cupboard*. Complement structures are an integral part of the mental representations through which we conceive of the mental states of others.

Children with intellectual disability form a large and heterogeneous clinical population, making any general characterisation of the pragmatic and ToM skills of this group all but impossible. Investigators have therefore tended to examine the pragmatic and other features of this population on a syndrome-by-syndrome basis. In this way, it has been reported that subjects with Williams syndrome have difficulty with the comprehension of irony and metaphor, as well as with referential communication, the latter in the context of communicating to a speaker that a message is inadequate (Annaz et al. 2009; John et al. 2009; Sullivan et al. 2003). Individuals with fragile X syndrome produce tangential language during conversation, engage in topic repetition, and have difficulty signalling non-comprehension of language to a speaker (Abbeduto et al. 2008; Murphy and Abbeduto 2007; Sudhalter and Belser 2001). Although individuals with Down's syndrome have less impaired pragmatic skills than subjects with these other genetic syndromes (Laws and Bishop 2004), specific pragmatic impairments including problems with referential communication, and metaphor and idiom comprehension have been reported in subjects with Down's syndrome (Abbeduto et al. 2006; Papagno and Vallar 2001). Alongside pragmatic impairments, a range of ToM deficits have been reported in Williams syndrome, fragile X syndrome and Down's syndrome (Abbeduto et al. 2001; Cornish et al. 2005; Grant et al. 2007; Sullivan and Tager-

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[1]  In a study of the conversational responsiveness of children with SLI, Bishop et al. (2000: 177) make this same point as follows: 'this study lends support to the notion that there is a subset of the language-impaired population who have broader communicative impairments, extending beyond basic difficulties in mastering language form, reflecting difficulty in responding to and expressing communicative intents'.

Flusberg 1999; Yirmiya et al. 1996). Few investigators, however, have attempted to examine ToM in the context of pragmatics in individuals with intellectual disability. One study which does is Abbeduto et al. (2004) who reported that limited narrative language skills in the subjects in their study contributed substantially to the failure of these subjects on a false belief task.[2]

Emotional and behavioural disorders (EBDs), which include attention deficit hyperactivity disorder (ADHD) and conduct disorder, have only recently been the focus of clinical pragmatic studies. These studies indicate that pragmatics is impaired in children with EBDs and, in some cases at least, is more impaired than structural language (Geurts and Embrechts 2008). In an investigation of pragmatic skills in ADHD, Bishop and Baird (2001) reported that 73 % of their child subjects attained a score below the 132 cut-off point indicative of pragmatic impairment on the Children's Communication Checklist (Bishop 1998). The scale measuring inappropriate initiation of conversation revealed particularly poor scores. Other pragmatic impairments in ADHD include difficulty drawing inferences when listening to spoken texts and problems with the comprehension of figurative language (Berthiaume et al. 2010; Bignell and Cain 2007; McInnes et al. 2003). Two-thirds of the children with conduct disorder studied by Gilmour et al. (2004) displayed pragmatic impairments and behavioural features similar to those found in autism. ToM and mentalising deficits have been identified in children with EBDs. Donno et al. (2010) reported poorer mentalising abilities in 26 persistently disruptive children than in comparison subjects. These children also possessed poorer pragmatic language skills than comparisons. Children with ADHD display poorer recognition of emotional facial expressions, lower levels of social perspective taking and worse performance on second-order ToM tasks than normally developing children (Buitelaar et al. 1999; Marton et al. 2009; Pelc et al. 2006). One study which has attempted to examine ToM in the context of pragmatics is Adachi et al. (2004). The children with ADHD in this study displayed problems with the comprehension of metaphor. However, there was no correlation between metaphor comprehension and performance in a ToM task.

# 5 Acquired Pragmatic Disorders and Theory of Mind

Many pragmatic disorders found in children and adults have their onset outside of the developmental period. These so-called acquired pragmatic disorders may be caused by a range of diseases and injuries. An adult may sustain a cerebrovascular accident or stroke that causes a focal lesion in either the left or right hemisphere of the brain. If there is left-hemisphere damage, pragmatics may be impaired in the presence of a wider aphasia. Even greater pragmatic impairment can result from a

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[2] Abbeduto et al.'s finding lends support to the second of the views delineated by Tager-Flusberg (2000) in the main text. This is the view that language and verbal interaction play a vital role in the development of ToM.

lesion in the right hemisphere of the brain, a hemisphere that for many years was deemed to be of lesser significance in terms of language and communication. An adult who is involved in a road traffic accident or similar traumatic incident sustains a quite different pattern of brain damage from that incurred in a stroke. The multi-focal brain pathology that occurs in a traumatic brain injury can not only cause pragmatic and discourse impairments, but can also lead to significant cognitive deficits which compromise communication. A number of mental illnesses have their onset in adulthood. These disorders, which include schizophrenia, bipolar disorder and depression, can have serious implications for a person's use of language or pragmatics. The population of adults with neurodegenerative disorders is large and growing. These disorders include the dementias, but also a range of other conditions such as Parkinson's disease, Huntington's disease and multiple sclerosis. Although the pragmatic impairments of individuals with dementia related to Alzheimer's disease are by now well characterised, researchers are increasingly turning their attention to investigating pragmatic impairments in a number of other neurodegenerative disorders. This section will examine what is known pragmatic disorders in each of the above clinical populations and will consider the role of ToM deficits within them.

Traditionally, it was believed that pragmatic deficits in adults with left-hemisphere damage (LHD) were a direct consequence of impairments in structural language skills. So it was argued, for example, that the adult with LHD who cannot engage in inversion of a subject pronoun and auxiliary verb (a syntactic deficit) will struggle to produce an indirect speech act such as 'Can you tell me the time?' (a pragmatic deficit). However, clinical studies of adults with LHD are increasingly revealing that pragmatic deficits in this clinical population are not adequately characterised in terms of linguistic deficits. There is evidence that while structural language skills can improve over time in adults with LHD, pragmatic skills may fail to improve appreciably (e.g. Coelho and Flewellyn 2003). Also, nonverbal pragmatic behaviours can also be impaired in adults with LHD (e.g. Cutica et al. 2006). Both scenarios indicate that a more nuanced explanation of pragmatic deficits in LHD needs to be found. In the meantime, studies of pragmatics in LHD have revealed problems in verbal pragmatic aspects of discourse production (Borod et al. 2000), difficulty with the comprehension of proverbs and implicatures (Chapman et al. 1997; Kasher et al. 1999) and, in patients with left prefrontal lesions, problems with pragmatic inferences (Ferstl et al. 2002). Some studies have also reported preserved areas of pragmatic functioning. In this way, Beeke (2003) describes the case of a man with agrammatic aphasia who exhibited recurrent use of 'I suppose' when his production of subject-verb constructions was generally poor, because he was motivated by an interactional need to produce unproblematic turns at talk. ToM skills in adults with LHD appear to be largely intact (Varley and Siegal 2000; Varley et al. 2001). This has led investigators to claim that ToM is functionally independent of grammar (Siegal and Varley 2006).

Pragmatic disorders in right-hemisphere damage (RHD) have been the focus of numerous clinical studies since Myers (1979) undertook the first formal investigation of impaired communication skills in stroke patients with RHD (see Sect. 3.3

in Cummings (2009) for discussion). Among the pragmatic deficits in this population, investigators have reported reduced sensitivity to violations of Gricean maxims and difficulty varying the production of requests in accordance with the interpersonal and situational features of an interaction (Brownell and Stringfellow 1999; Surian and Siegal 2001). The comprehension of non-literal language in idioms, proverbs and humour is compromised (Brundage 1996; Cheang and Pell 2006; Papagno et al. 2006). Discourse skills are often markedly disrupted in individuals with RHD. These subjects have been reported to produce narratives that have poor information content and lack cohesion and coherence (Marini et al. 2005). Blake (2006) found that tangentiality, egocentrism and extremes of quantity (verbosity or paucity of speech) were features of the discourse produced by the adults with RHD in their study. Although some studies have revealed ToM and mentalising deficits in the RHD population (Griffin et al. 2006; Happé et al. 1999; Weed et al. 2010), a recent review of work in this area by Weed (2008) judged that evidence for a specific ToM deficit in RHD is still inconclusive. One of the few studies to examine the relationship between ToM and pragmatics in RHD is Winner et al. (1998). These investigators found that the subjects with RHD in their study performed significantly worse than controls on one of two measures of second-order belief attribution. Moreover, the ability to distinguish lies from ironic jokes correlated strongly with two second-order belief measures. Winner et al. (1998: 90) concluded that 'the fragility of RHD patients' understanding of second-order mental states underlies a portion of their difficulties in discourse comprehension'.

Subjects who sustain a traumatic brain injury (TBI) can have numerous neuropsychological sequelae related to the multi-focal nature of their brain pathology. Among the language and cognitive problems found in this clinical population, subjects with TBI often present with significant pragmatic and discourse impairments as well as ToM deficits. MacLennan et al. (2002) found pragmatic impairments in 86 % of 144 patients with TBI in their study. On a pragmatic rating scale, components that examined cohesion, repair, elaboration, initiation and relevance displayed the highest frequency of impairment. Other pragmatic impairments reported in subjects with TBI include violations of Gricean maxims (quantity, relation, manner), problems with topic management and the use of politeness markers in conversation, and difficulties in inferencing and intentionality, the latter related to the mental states and intentions involved in pragmatic skills such as the production of speech acts and the understanding of irony (Coelho et al. 2002; Dennis and Barnes 2001; Douglas 2010; Togher and Hand 1998). Although ToM deficits have been extensively reported in the TBI population (Henry et al. 2006; Milders et al. 2006; Muller et al. 2010; Turkstra et al. 2004),[3] there is some uncertainty about the role of these deficits in the pragmatic impairments of this clinical population. Some investigators have argued that ToM deficits are probably

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[3] Some studies have failed to find evidence of ToM impairments in patients with TBI. Bach et al. (2006) reported that the patients with TBI with and without behavioural disturbance in their study were unimpaired on ToM tasks.

unrelated to the pragmatic skills of clients with TBI (e.g. Muller et al. 2010). For other investigators, a relationship between ToM and pragmatics can be demonstrated in these clients. In this way, McDonald and Flanagan (2004) reported that the second-order ToM judgements of the adults with TBI in their study were related to the ability to understand social or conversational inference.

A number of mental illnesses which have their onset in adulthood can cause marked pragmatic disturbances. The most prominent and extensively investigated of these conditions is schizophrenia. Investigators have reported pragmatic difficulties in the decoding of Gricean conversational maxims, the use of linguistic context during language processing and the interpretation of metaphor and idiom in patients with schizophrenia (Kuperberg et al. 2000; Mazza et al. 2008; Tavano et al. 2008; Tényi et al. 2002). These patients also contribute irrelevant information and engage in derailments during narrative production (Marini et al. 2008). Some of these pragmatic impairments have been examined in relation to the ToM skills of subjects with schizophrenia. Brüne and Bodenstein (2005) investigated the relation of proverb understanding to ToM in 31 patients with schizophrenia. These investigators found that approximately 39 % of the variance of proverb comprehension in these patients was predicted by ToM performance. Mo et al. (2008) studied metaphor and irony comprehension and conducted first- and second-order ToM tasks in 29 patients with schizophrenia who were in remission. These patients had a ToM deficit and were impaired in their comprehension of metaphor and irony. However, only metaphor comprehension was significantly correlated with second-order false belief understanding. Langdon et al. (2002) found impairments in false-belief picture sequencing (a test of ToM) and the understanding of irony and metaphor in the subjects with schizophrenia in their study. Poor ToM performance was associated with poor understanding of irony, but not with metaphor comprehension. The different findings to emerge from these studies may reflect the clinical status of the patients used in these investigations—patients with remitted schizophrenia (Mo et al.) versus patients with formal thought disorder (Langdon et al.).[4]

A large number of neurodegenerative disorders can cause pragmatic impairments in adults. The most extensively investigated pragmatic impairments in this group of disorders are those found in dementia related to Alzheimer's disease (AD). Among the pragmatic and discourse impairments in subjects with AD, investigators have reported problems with referential communication (Carlomagno et al. 2005; Feyereisen et al. 2007), the use of cohesion devices (Ripich et al. 2000), and the comprehension of figurative language (Papagno 2001). The pragmatic features of non-Alzheimer's dementias are increasingly the focus of clinical studies (e.g. Kertesz et al. 2010). Rousseaux et al. (2010) studied verbal and non-verbal communication in patients with Alzheimer's disease, behavioural variant frontotemporal dementia (FTD) and dementia with Lewy bodies (DLB). Pragmatic skills

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[4] There is some basis for this claim in the findings of several studies that different symptom profiles in schizophrenia appear to be associated with certain patterns of ToM and pragmatic deficits (e.g. Corcoran and Frith 1996; Montag et al. 2011).

were well preserved in patients with DLB. Patients with AD exhibited some pragmatic impairment in greeting behaviour, understanding deictics and using gestures. The most severe pragmatic impairments were found in patients with FTD, particularly in responding to open questions, presenting new information, logically organising discourse, adapting to interlocutor knowledge and emitting feedback. Beyond the dementias, pragmatic disorders have also been documented in patients with Parkinson's disease, including problems in the comprehension of metaphor, irony and speech acts, and difficulty with conversational appropriateness and turn taking (Holtgraves and McNamara 2010; McNamara and Durso 2003; Monetta and Pell 2007; Monetta et al. 2009). A recent study of patients with Huntington's disease has reported impaired performance on complex comprehension tasks which draw upon pragmatic and discourse skills (Saldert et al. 2010).

There is now an extensive body of research findings suggesting the presence of ToM deficits in adults with neurodegenerative disorders. One of the most consistent findings of this research is that patients with frontal or behavioural variant FTD experience significant ToM deficits (Fernandez-Duque et al. 2009; Gregory et al. 2002; Lough et al. 2006; Torralva et al. 2009). However, a range of ToM deficits have also been identified in patients with Alzheimer's disease (Fernandez-Duque et al. 2009; Gregory et al. 2002), Parkinson's disease (Bodden et al. 2010; Saltzman et al. 2000) and motor neurone disease (Gibbons et al. 2007; Girardi et al. 2011). These studies are revealing interesting features of ToM deterioration in subjects with neurodegenerative disorders. In this way, Castelli et al. (2011) found that the ToM skills of their patients with Alzheimer's disease were lost in an order that is opposite to the developmental sequence followed during the acquisition of ToM. Although there is a well-developed literature on ToM deficits in patients with neurodegenerative disorders, as yet few studies have undertaken to examine the relation between these deficits and pragmatic skills. Two studies that have done so are Cuerva et al. (2001) and Monetta et al. (2009). In a study of 34 patients with probable Alzheimer's disease, Cuerva et al. reported a significant association between performance on a test of second-order false belief and pragmatic deficits in the interpretation of conversational implications and indirect requests. Monetta et al. examined ToM performance and irony comprehension in 11 non-demented patients with Parkinson's disease. These investigators found a significant correlation between these patients' ability to interpret an utterance as a lie or an ironic remark and performance on second-order belief questions.

# 6 Theory of Mind Research in Pragmatic Disorders: Critical Commentary

There can be little doubt that a voluminous literature on theory of mind now exists. Much is known about the emergence of ToM skills in typically developing children, the further maturation of these skills in adolescents and adults and their

deterioration in normally aging individuals. Today, studies of ToM in clinical populations extend well beyond the autism spectrum disorders to include individuals with neurocognitive, neurodegenerative and neuropsychiatric disorders. Even within these populations, investigators are increasingly moving towards characterisations of ToM based on the diagnostic sub-types of a disorder. For example, it is now not uncommon for researchers to examine the ToM skills of patients with schizophrenia in relation to the (positive and negative) symptom profiles of these patients (see footnote 4). This abundance of empirical research into ToM has been more than an academic exercise for theorists and clinicians. The results of this research have been used to devise ToM-targeted interventions, which are increasingly employed in the treatment of children and adults with conditions such as autism spectrum disorders and schizophrenia (Roncone et al. 2004; Swettenham 2000). In short, ToM research has delivered many theoretical insights and clinical gains for both researchers and patients. However, the same cannot be said of one particular aspect of ToM research. That aspect concerns the relationship between ToM and pragmatics. The difficulty here lies not in the lack of empirical research which has directly examined this relationship—although it is certainly the case that few studies have undertaken such an examination—but in the way in which investigators have come to construe the ToM skills that are integral to pragmatic interpretation. This issue will be addressed throughout this section and is developed further in Cummings (2009).

In parallel with the vast expansion that has occurred in ToM research in recent years, there has been an equally dramatic proliferation in the number and type of tests that purport to examine theory of mind. The so-called Sally-Anne experiments[5] that have become synonymous with early ToM research into autism undertook to examine a subject's ability to attribute first-order false beliefs to the mind of an actor in a scenario. First-order false-belief tests now sit alongside second-order false-belief tests, deception tests, tests of imagination, 'seeing leads to knowing' tests and tests of understanding the causes of emotion, to name just a few of the ToM tests currently in use (Baron-Cohen 2000). These tests are not without their difficulties.[6] The particular difficulties that will be examined in this section relate to a subset of ToM tests which, it is claimed, assess ToM skills in pragmatic interpretation. Baron-Cohen (2000) classifies these tests as follows: (1) tests of understanding metaphor, sarcasm, and irony; (2) tests of pragmatics in speech; (3) tests of recognition of violations of pragmatic rules. Categories (2) and (3) include tests that examine faux pas detection and the recognition of violation of Gricean conversational maxims, respectively. In demonstration of the tests subsumed by (1), consider the following investigation by Mo et al. (2008) of metaphor

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[5]  Sally-Anne experiments derive their name from the two dolls—Sally and Anne—that are used in these false-belief tests. See an account of these tests by Baron-Cohen et al. (1985) in Sect. 3.

[6]  There is some evidence that these different ToM tests may not examine the same mentalising skills. For example, Spek et al. (2010) found low or absent correlations between the Eyes test and three other ToM tests used in their study of adults with high-functioning autism and Asperger syndrome.

and irony comprehension in patients with schizophrenia. These patients, who were all in remission at the time of the study, also completed first- and second-order ToM tasks. Metaphor and irony comprehension was assessed by means of narrated stories. These stories were followed by questions which were intended to test patients' understanding of the metaphorical and ironical content of the narrated passages. One of the passages used in this study is shown below, along with the questions which were intended to probe the patients' understanding of metaphor and irony:

> Xiao Zhang could never make up his mind about anything. One day when Li Qi and Wang Li asked him if he would like to go to the cinema, Xiao Zhang could not decide. It took him so long to make up his mind that by the time he did, they had already missed the first half of the film…
>
> On the metaphorical presentation, the story continued… Li Qi said: 'Xiao Zhang, you are a ship without a captain!'
>
> **Metaphor** question: What does Li Qi mean? Does he mean Xiao Zhang is good or not good at making decisions?
>
> On the ironical presentation, the story continued…Wang Li said to Xiao Zhang: 'You really are so good at making decisions!'
>
> **Irony** question: What does Wang Li mean? Does he mean Xiao Zhang is good or not good at making up his mind?

This passage and its accompanying probe questions are typical of those used by investigators who examine the relation of ToM to pragmatics in clinical subjects. Yet, neither the metaphor question nor the irony question is successfully tapping the particular pragmatic phenomenon it purports to examine. In the metaphorical presentation of the passage, regardless of how the respondent answers the metaphor question, he or she becomes committed to a presupposition of that question, a presupposition to the effect that the utterance 'You are a ship without a captain!' is stating something about Xiao Zhang's ability to make decisions. In not allowing the respondent the opportunity to deny a metaphorical interpretation of the passage, the probe question is itself not felicitous. This somewhat ironical pragmatic error on the part of these investigators is accompanied by an even greater problem in the irony version of the same passage. The irony question 'What does Wang Li mean?' invites the response 'Wang Li thinks that Xiao Zhang is good/not good at making up his mind'. This question and its response involve a first-order belief, Wang Li's belief about Xiao Zhang's decision-making ability. Yet, this is quite different from the second-order ToM reasoning which is the basis of the interpretation of irony in language. In order for *this* interpretation to be adequately tested, Mo et al. needed to pose a quite different question, a question to the effect 'What does Wang Li think that Xiao Zhang believes the utterance *You really are so good at making decisions* means?'. The response to this question—Wang Li thinks that Xiao Zhang believes the utterance means *x*—is the belief that the respondent must attribute to Wang Li's mind in order to be said to have appreciated the ironic intent of Wang Li's utterance. It is only by asking this latter question that Mo et al. can expect to assess the second-order ToM reasoning and irony comprehension of the subjects with schizophrenia in their study.

Tests of faux pas detection are used extensively by ToM researchers. To assess the extent to which these tests succeed in examining the ToM skills used in 'pragmatics in speech', we turn to a study by Baron-Cohen et al. (1999). These investigators examined the recognition of faux pas by 12 children with Asperger's syndrome (AS) or high-functioning autism (HFA). Sixteen normal control subjects also participated in the study. Ten short stories were presented to the children on an audiotape. In one of these stories, a young girl called Sally is staying at her Aunt Carol's house. Sally has short blonde hair. One day, the doorbell rang. When Sally and her aunt opened the door, they saw a neighbour called Mary. After saying "Hello" to Sally and Carol, Mary went on to say "Oh, I don't think I've met this little boy. What's your name?". Aunt Carol responding by saying "Who'd like a cup of tea?". Subjects were then asked a series of questions. One of these questions examined if subjects had detected the faux pas in the story ('In the story did someone say something that they should not have said?'). A second question required subjects to identify the faux pas ('What did they say that they should not have said?'). A third question tested subjects' understanding of the language used in the story ('Whose house was Sally at?'). A fourth question aimed to assess if subjects were aware that the faux pas was a consequence of a false belief on the part of the speaker in the story ('Did Mary know that Sally was a little girl?').

Tests of faux pas detection of the type just described pose the following problem for ToM researchers. To the extent that these tests are supposed to reveal something of the ToM skills at work in pragmatic interpretation, they need to examine second-order ToM reasoning, i.e. one person's beliefs about another person's beliefs. Yet, in asking the children with AS or HFA in this study to detect if a faux pas has been committed, Baron-Cohen et al. are only examining first-order ToM reasoning. To see this, consider the faux pas committed by Mary in the above scenario. Mary calls Sally a little boy because she entertains a mistaken or false belief to the effect *Mary believes that Sally is a boy*. However, this belief is a first-order false belief about the world, not a second-order belief of the type *Mary believes that Sally believes that x* which is integral to all pragmatic interpretation. The child who recognises that Mary entertains the false belief that Sally is a boy is clearly capable of first-order ToM reasoning. And certainly no pragmatic interpretation would be possible if hearers could not also assume certain beliefs on the part of their interlocutors about the world. However, these first-order beliefs fall well short of the second-order ToM reasoning that is the basis of utterance interpretation. To the extent that the recognition of faux pas is none other than the recognition of first-order false belief, it is unsurprising that while 75 % of normal children passed this faux pas detection test, only 18 % of children with AS or HFA managed to do so—false belief performance is significantly depressed in subjects with AS or HFA, after all. Quite apart from revealing anything about the ToM skills at work in pragmatics, faux pas detection tests serve only to reinforce the well-established finding that children with ASD fail first-order false-belief tests on account of a specific ToM deficit in mental state attribution.

A further category of ToM test examines the recognition or detection of the violation of pragmatic rules. Typically, the rule violations in question take the

form of Gricean conversational maxims of quality, quantity, relation and manner with a number of studies also examining politeness maxims. A study by Surian et al. (1996) examined both types of pragmatic rule violation in high-functioning children with autism. The rationale for this study is presented by Surian et al. (1996: 58) as follows: 'if children with autism have deficits in ascribing mental states, and particularly ascribing intentions, then they should fail to recognise when such Gricean maxims are being violated'. In demonstration of the conversational scenarios presented on audiotape to subjects, consider the following violation of the maxim of relation:

A: What is your favourite programme on telly?
B: My favourite is sandwiches.

In the above exchange, B's response to A's question is clearly violating the maxim of relation—an utterance about sandwiches fails every expectation of relevance that A could have when he poses a question about favourite TV programmes. However, the child with autism who recognises this violation has really not engaged in the type of mental state attribution that is the basis of pragmatic interpretation. To see this, one need only consider the role of Gricean maxims within the recovery of implicatures. Even as the speaker in the above exchange recognises that the hearer has produced an irrelevant utterance, A uses an assumption of mutual adherence to the principle of cooperation to derive an implicature of B's utterance. One such implicature may be that B does not have a single favourite programme, as is presupposed by A's question, but actually likes a number of programmes on the theme of food and cooking. Alternatively, B may be seeking to implicate that he finds A's question trivial and does not wish to provide a serious response. Whichever implicature B is attempting to generate, it is clear that the recognition that the relation maxim has been violated is nothing more than a first step on the road to recovering this implicature. It is only when this maxim violation is used by A to recover the intended implicature of B's utterance, a process that requires A to attribute a particular communicative intention to B's mind, that the interlocutors in this exchange can be said to be engaging in the type of mental state attribution that is the basis of pragmatic interpretation. Surian et al. found that while most children with autism performed at chance on this maxim task, all children with specific language impairment and all normal controls performed above chance. However, given that this task is not even assessing the ToM skills used in pragmatic interpretation, it emerges that this finding lacks any real implications for our knowledge of ToM.

The discussion in this section has revealed a number of shortcomings in ToM research into pragmatics in general and pragmatic disorders in particular. Firstly, tests of the comprehension of pragmatic phenomena such as irony were shown not to assess the second-order ToM skills that are integral to pragmatic interpretation. These tests, it was argued, targeted instead an actor's beliefs about the world, i.e. first-order ToM reasoning. Secondly, in examining a subject's ability to detect an actor's mistaken or false belief about the world, faux pas detection tests were found to be little more than first-order false-belief tests. As such, they failed to

assess any part of the ToM skills used in pragmatic interpretation and simply reinforced the long-established finding that performance on false-belief tests is impaired in subjects with ASD. Thirdly, studies examining the recognition of maxim violations were shown to hold no lessons for the ToM skills used in pragmatic interpretation. The mere recognition that a maxim had been violated, it was argued, was simply the first step on the road to recovering the implicature of an utterance and could in no way come to represent the attribution of communicative intentions that is the essence of pragmatic interpretation. Clearly, these various failings of ToM studies in pragmatics need to be addressed if theorists and clinicians are to have confidence in the results to emanate from these studies. I have argued that the place to begin this revision of ToM research is in something quite fundamental, the notion of what constitutes pragmatic interpretation itself (Cummings 2007b, 2009). It is only when we are clear on the nature and extent of this notion that we can expect to devise a ToM framework that is capable of representing the mentalising skills involved in the interpretation of utterances.

## 7 Theory of Mind Theories

Empirical studies of ToM are important because their findings play a key role in ToM theory construction. The set of mentalising skills that investigators have identified as ToM are consistent with different theoretical accounts of these skills. This section will examine the three main contenders to a theoretical account of ToM: ToM as a cognitive module (modular theory of ToM), ToM as theory construction (theory theory account), and ToM as imaginative projection (simulation theory). Although these theoretical accounts make quite different claims about the development and nature of ToM, each account receives some degree of validation from empirical studies. This discussion is therefore less concerned with attempting to decide among these alternative theories than it is with teasing out the features of each which may hold particular significance for an account of ToM that has relevance to pragmatics. It does so in the knowledge that not every aspect can be addressed in detail. The reader is referred to Cummings (2009) for a more extensive discussion of this area.

Simon Baron-Cohen and Alan Leslie are leading proponents of the view that a cognitive module underlies the human ability to attribute mental states to the minds of others. This module has certain features which will be recognized by any reader familiar with Jerry Fodor's notion of modularity (Fodor 1983). Such a module is informationally encapsulated, meaning that there are restrictions on the availability of information. In this way, information within the module may not be available outside the module, even though the module's output is available to the mind's central system, for example. Similarly, information outside the module may not be accessible to the workings of the module itself. A ToM module is domain specific, that is, it contains specialized representations and computations which relate only to

the mental states of intentional agents.[7] A further feature of a ToM module is its innateness, that is, it forms part of a human being's genetic endowment. A ToM module is also fast (it engages in rapid processing of intentional information) and mandatory (it cannot choose not to process intentional stimuli). Furthermore, a ToM module may be selectively impaired, as we have seen in the case of autism, for example (Scholl and Leslie 1999). These features of modular ToM, theory theorists have argued, are antithetical to the developmental changes that young children go through on their way to acquiring a theory of mind.[8] Modular ToM theorists counter this challenge by arguing that there is no requirement within modularity itself which precludes the possibility that modules can develop from within (even though the requirement for informational encapsulation restricts the information that will be available to such an internal developmental process) (see Scholl and Leslie (1999) for discussion of this developmental process in relation to modular ToM).

According to theory theorists, the young child who is acquiring ToM skills is effectively constructing a theory of the actions and mental states of those around him. In much the same way that the scientist constructs theories to explain and predict events in the natural world, the child is constructing a theory which he uses to explain and predict the behaviour of others in the social world. This scientific analogy, and the theoretical position it seeks to capture, is characterised by Gopnik et al. (2000: 51) as follows:

> [W]e propose that our ordinary understanding of the mind proceeds by the formation, revision and replacement of successive theories of the mind. […] Like scientists, children understand the world by constructing coherent views of it and changing those views in the light of new evidence that they obtain. Children play an active role in this process by making predictions, seeking explanations and considering evidence that is relevant to the mind.

Certain other features of the theory theory account are noteworthy. Theories in one domain can influence theories in another domain, a transfer of information and knowledge that is not possible on a modular theory of ToM on account of the informational encapsulation of cognitive modules. The succession of theories on this account is made possible by general inferential mechanisms, which are not available to cognitive modules (such mechanisms, after all, are likely to be part of the mind's central system on a modular approach). The theory theory account of ToM also posits innate structures in the form of theory-formation mechanisms. These mechanisms are evolutionarily determined and enable the developing child

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[7] It is worth remarking that the original proponent of modularity—Fodor (1983)—would disavow the attempt to locate ToM skills within a domain-specific cognitive module. For Fodor, such skills are located within a non-modularised central system in the mind. Frye (2000: 149) makes this same point as follows: 'An odd aspect of the view that theory of mind is domain specific is that it is one Fodor's (1983) own approach to modularity would explicitly disclaim'.

[8] That one theory theorist, Alison Gopnik, cannot even conceive of modularity as permitting of developmental change is evident in her use of the word 'indefeasible' when characterising a ToM module. A ToM module, she states, is 'a genetically-determined and indefeasible way of understanding the mind' (Gopnik et al. 2000: 51).

to make inferences about the underlying structure, particularly causal structure, of the world based on his observation of events. A further innateness component in the theory theory account is the claim that babies are born with initial, starting-state theories about the mind and other aspects of the world. These theories are 'genuinely theoretical' in that they are 'specific, substantive, coherent, abstract, representations of the world that allow babies to make predictions, and to interpret, and even perhaps explain, what they see around them' (Gopnik et al. 2000: 52). These representations are revised as the child encounters new evidence in much the same way that scientists need to revise the theories they work with if they no longer accord with the data in an area. So the initial theories that the child sets out with do not constitute the architecture of the fully mature representational system. The process of theory revision that takes the child from his initial theories to this final state is the basis of the developmental changes in ToM that were described in Sect. 3.

According to simulation theorists, our mentalising abilities are not explained by cognitive modules or by theory construction. Rather, when we simulate, we are imaginatively projecting from our own mental activity (what we would think, believe or desire in a situation) to what someone else is likely to think, etc. in a similar situation. Carruthers and Smith (1996: 3) capture this key notion within simulation theory as follows:

> According to this view, what lies at the root of our mature mind-reading abilities is not any sort of theory, but rather an ability to project ourselves imaginatively into another person's perspective, *simulating* their mental activity with our own (italics in original).

Proponents of simulation theory differ with respect to the details of how simulation comes about. According to Goldman (1993), simulation requires first-person awareness of one's own mental states, with the inference from these states to the mind of another taking the form of an argument from analogy. Alternatively, simulation theorists like Gordon (1996) argue that recognition of one's own mental states is not a requirement of simulation and that the type of imaginative identification that occurs in simulation can take place without introspective self-awareness. In one version subscribed to by Gordon (1986), our practical reasoning system is taken 'off-line' and is fed pretend inputs such as images and suppositions. Based on these inputs, the system arrives at a decision which is not acted upon (the system is off-line, after all), but becomes the basis of our anticipation of another person's behaviour:

> Our decision-making or practical reasoning system gets partially disengaged from its "natural" inputs and fed instead with suppositions and images (or their "superpersonal" or "sub-doxastic" counterparts). Given these artificial pretend inputs the system then "makes up its mind" what to do. Since the system is being run off-line, as it were, disengaged also from its natural output systems, its "decision" isn't actually executed but rather ends up as an anticipation…of the other's behaviour (Gordon 1986: 170).

Which of these theoretical approaches to ToM—if any—is best able to capture the mentalising skills used in utterance interpretation is a question of interest to researchers in both theoretical and clinical pragmatics. We conclude this chapter

with some comments about the pragmatic plausibility of each of these approaches. On the (unproblematic) assumption that ToM cannot be any less dynamic and resourceful than pragmatic interpretation itself, it is difficult to see how a modular account of ToM can capture the mentalising skills at work in utterance interpretation. Of necessity, hearers must be able to draw upon information and knowledge of any type as they proceed to attribute communicative intentions to the minds of speakers during the interpretation of utterances. Imagine how difficult it would be to constrain in advance of the interpretation of an implicature the information or knowledge that a hearer can have access to in the recovery of that implicature (of course, I would argue that it is not just difficult but completely impossible). Yet, just such restrictions on the type and flow of information are exactly what the modular ToM theorist is offering us through his requirements for informational encapsulation and domain specificity. Of course, a modular account of ToM receives strong support from two prominent pragmatic theorists, Dan Sperber and Deirdre Wilson. According to Sperber and Wilson (2002), their relevance-based procedure for the interpretation of utterances forms a sub-module of the mind-reading module. This view is consistent with the cognitive scientific character of their relevance-theoretic account more generally, an account that I first challenged in Cummings (2005). It is difficult to see how a relevance-based procedure located within a mind-reading module evades any of the criticisms that were made in that context.

A theory theory account of ToM certainly lacks the prominence that modular accounts of ToM have enjoyed within pragmatics. Yet, there are reasons to believe that a theory theory account of ToM may be more in tune with the open texture of pragmatic interpretation than other theoretical approaches to ToM. As the theory theory position has been expounded by Gopnik and others, it is clear that theories in one domain can influence theories in another domain. This flow of information or knowledge between domains forms the very essence of pragmatic interpretation and must be embraced by any theoretical account of ToM that hopes to capture the mentalising skills involved in such interpretation. In my determination of the intended referent of the demonstrative pronoun 'that' in the utterance *That was unexpected*, I must surely draw upon several theories including my theories of visual perception, word meaning and grammar, and physical space and movement to establish that the speaker intended to refer to the man who has just fallen into a hole in the ground. The general inferential mechanisms that theory theorists argue are the basis of theory revision may prove ultimately to be more akin to the type of inferencing at work in pragmatic interpretation than the highly specialised mechanisms of inference that are posited to exist within cognitive modules. Certain findings to emerge from empirical studies lend tentative support to this suggestion. One such finding is that clinical subjects who exhibit significant pragmatic and ToM deficits often also present with more general impairments of inference. For example, individuals with schizophrenia have been shown to have difficulty with deductive reasoning as well as various types of inductive or probabilistic inference (Armstrong et al. 2012; Averbeck et al. 2011; Corcoran 2003; Speechley et al. 2010; Titone et al. 2004).

Intuitively at least, simulation theory captures a plausible idea that resonates with our commonsense understanding of how the interpretation of utterances proceeds. There is a clear sense in which as communicators, we come to attribute certain communicative intentions to the mind of a speaker exactly because we can imagine ourselves holding just those same intentions within the situation in which the speaker finds himself. It is because I can envisage myself experiencing certain negative thoughts about a child who is behaving badly at a party that I can go on to attribute an ironic communicative intention to the speaker who utters *What a delightful child!* Notwithstanding its initial plausibility, simulation theory still experiences a significant difficulty as an account of the ToM skills that are involved in pragmatic interpretation. To appreciate this difficulty, we need to return to Gordon's account of how simulation takes place, an account in which our practical reasoning system is taken 'off-line' and fed certain inputs. Let's imagine that the person at the party to whom the above utterance is directed feeds certain inputs into their 'off-line' practical reasoning system, such as the beliefs that the child is behaving badly, that people dislike badly behaved children, and so on. Based on these input beliefs, the hearer's practical reasoning system might reasonably be expected to arrive at the decision that the badly behaved child at the party is anything but delightful. This decision is then attributed as a communicative intention to the mind of the speaker of the utterance. However, in selecting certain beliefs and feeding these into the hearer's practical reasoning system, we have not explained pragmatic interpretation, but rather transformed the problem of interpretation into the problem of how certain beliefs are selected for the simulation. It is this selection process that a pragmatically acceptable theory of ToM must explain, and about which simulation theory says nothing (see Cummings (2009) for further discussion).

## 8 Summary

In this chapter, the role of ToM in pragmatic disorders has been examined. It was argued that ToM is an indispensable component of all pragmatic interpretation and, as such, can be expected to contribute to pragmatic disorders. For some years, investigators have examined the emergence of ToM skills in normally developing children and, more recently, the maturation and decline of these skills in adults and aging subjects. This large and growing literature has produced important findings, several of which were discussed. Children and adults with a range of clinical disorders present with concomitant pragmatic impairments and ToM deficits. In reviewing studies of these disorders, it was consistently remarked that few investigators had examined the relationship between ToM deficits and pragmatic impairments. It was also argued that ToM research is not without difficulties which threaten to stall further progress in our understanding of the role of ToM in pragmatic disorders. Several flaws in ToM research were examined. Finally, three

theoretical accounts of ToM were examined and assessed for their relevance to pragmatic interpretation.

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