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Language and Theory of Mind: A Synthesis of Empirical Research on Cognitive and Linguistic Interdependencies

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Abstract

This literature review examines the intricate relationship between Theory of Mind (ToM) and language development, analysing whether ToM serves as a foundational cognitive precursor for language or if both capacities develop interactively. The LR examines multiple approaches, including the lens of bilingualism, autism and deafness. Multiple studies with various methods including experiments, longitudinal studies and neuroimaging studies will be investigated to reach a holistic understanding of the relationship between ToM and language. The review synthesises evidence suggesting that early ToM abilities, such as joint attention and mental state attribution, provide a critical base for effective language use, while language acquisition further refines ToM functions. Neurological findings indicate overlapping brain regions involved in both ToM and language processes, suggesting shared cognitive mechanisms rather than distinct faculties. Additionally, the influence of social and cultural contexts on the development of these abilities is explored, underscoring the importance of interaction in shaping both. The review also highlights gaps in research, particularly in understanding the specific cognitive functions underlying this relationship, and calls for focused investigation into individual components of ToM and language. Implications for therapeutic interventions, especially in speech-language pathology and special education, are also discussed.

Introduction

Theory of Mind (ToM) is a psychological concept that refers to one's ability to attribute, identify and understand one's own and another's mental states. It also involves understanding that one's own mental states may differ from another's. The process of making inferences about mental states, such as beliefs, intentions, desires, needs, or goals is called mentalising *[Baron-Cohen 1985]*. *Premack and Woodruff* defined it as a system essential in daily social interaction, as it helps understand others' mental states, predict and anticipate the behaviours of others.

Baron-Cohen explains ToM as consisting of two main stages: understanding another person's thoughts, and understanding false beliefs (the ability to understand one person's thoughts about another person's thoughts). In addition to this, the possession of ToM is essential to understanding pragmatics, as almost every aspect of pragmatics involves sensitivity to speaker and listener mental states *[Baron-Cohen 1985]*. Language features like sarcasm, intonations, comprehension of and figurative speech like metaphors and irony, often require pragmatic understanding and by extension require ToM. For example, for person A to understand person B's sarcastic reaction "yeah, right", they would need to possess ToM to understand that the *intention* of person B is expressing dissatisfaction, and they would have to *infer* from behavioural

information or contextual information that the words "yeah" and "right" are used to mean the opposite of what they mean. He also explains 'joint attention' (when two or more people direct their attention to the same subject of interest; this also involves the understanding that attention is selectively directed to a particular thing, and seeing is not just looking but specific attention to specific items or people) to be a function of ToM. He also called ToM *'mindreading'* as it largely revolves around inferring another person's mental states.

This Literature Review examines the relationship between ToM and language, through multiple approaches, including the lens of bilingualism, autism and deafness. Multiple studies with various methods including experiments, longitudinal studies and neuroimaging studies will be investigated to reach a holistic understanding of the relationship between ToM and language.

The role of language in the development of Theory of Mind:

Psychologists like *Tomasello* and *Vygotsky* have long highlighted the essential role of social interaction and imitation in the development of children's general cognitive abilities, joint attention and higher order thinking such as ToM. *Tomasello* highlighted the role of social cooperative and communicative interactions to develop joint attention and ToM. *Vygotsky* explained the role of social interaction in the development of higher order thinking such as ToM. Majority research in the field is in alignment with this idea, suggesting the vital role of language as a predictive or causative factor in the development of ToM.

For example, *Astington and Jenkins' (1999)* landmark longitudinal study found language as a predicting factor of later ToM development. The study was conducted with three-year-olds over a period of seven months, assessing Theory of Mind (ToM) through false belief tasks and evaluating language ability using standardised tests primarily focused on semantics and syntax. Their findings revealed that earlier language abilities were predictive of later ToM performance; however, earlier ToM performance did not serve as a predictor for subsequent language ability. These results support the prevailing notion that language plays a fundamental role in the development of ToM, rather than vice versa.

The notion that grammatical development plays a causal role in the development of Theory of Mind (ToM) is supported by *De Villers (2000)*, who proposed that the acquisition of complement structures (words/phrases/clauses required to complete a sentence) is a necessary prerequisite for understanding false beliefs. His research identified comprehension and production of complement structures as the strongest predictors of false belief understanding among 3- to 4-year-olds, in contrast to other syntactic measures, which showed much weaker associations with false belief understanding. A test called *'Memory for Complements Test'* was developed to test this. An example of an item in this test was: *"she said there was a spider in her cereal" "but it was just a raisin" "what did she say was in her cereal".* Children were highly likely to respond with the reality answer than what the person *said or thought*. Initially this was explained by the idea that children made errors because they did not understand false beliefs. However as the word was changed from *"think"* (an abstract term used to describe a mental state) to *"said"* the children made the same mistake, demonstrating that the word *think* was not at fault. Passing the complement task was then understood as a linguistic milestone that must precede and predict development of ToM. To further support this *De Villers* investigated children with language delay, arguing that if language did not play a role in ToM development, children with language delays would be able to pass non verbal false belief tasks but fail complement tasks, however no such children were found. *De Villers* found understanding of complement tasks as a highly significant predictor of false belief understanding. They argued that understanding of complement structures was essential in communicating someone's

mental state and distinguishing it from reality, and this paved the way for the development of false belief reasoning. The breakthrough in a child's development arises when the child is able to represent, via complex grammatical language, the contrast between the content of his own beliefs, and the knowledge of others and to use this contrast to reason about other's behaviour. Being able to talk about minds leads to a richer ToM, one that continues to help make sense of social situations.

Similarly, other studies, like *Farrar and Maag 2002*, have demonstrated that overall vocabulary size, as well as grammatical competence at age two predicts ToM performance at age four. It has been argued that while these correlations suggest that grammatical competence may play a unique role in ToM development, a more generalised language ability is the most critical factor in predicting subsequent ToM performance *(Farrar & Maag, 2002).*

In addition to this, research investigating deafness has demonstrated that deaf children raised in hearing families exhibit delayed Theory of Mind (ToM) development compared to their peers with deaf parents who are native sign language users. It has been suggested that the delayed exposure to language (typically sign language), in deaf children from hearing families contributes to their lower ToM abilities *(Wright, Serratrice, & Stojanovic, 2023)*. This is attributed to the understanding that a linguistically rich environment is critical for the emergence and progression of ToM in children.

Deaf children raised in hearing families often lack exposure to mentalistic conversations, which involve sharing thoughts and feelings. This inadequacy can significantly impact their knowledge—both receptive and productive—of vocabulary (e.g., the distinction between the words *"know"* and *"believe"* are understood through mentalistic conversation) and syntax, particularly with respect to sentential complements. Such syntactic structures have been shown to play a crucial role in the understanding of false beliefs, a fundamental aspect of Theory of Mind (ToM) *(Morgan et al., 2014; Wright et al., 2023).*

Comparable results have been observed when comparing Late Talking (LT) children to their typically developing peers. A study conducted by *Cheung et al. (2022)* found that LT children may experience delays in developing picture comprehension skills relative to typically developing children. This discrepancy suggests that the reduced conversational engagement of Late Talking children may result in a less linguistically rich environment compared to their peers, which subsequently impacts their Theory of Mind (ToM) development. *Callaghan (2000)* proposes that children utilise linguistic labels to scaffold their understanding of pictures and symbols, indicating that early language impairments can adversely affect not only the comprehension of symbols associated with linguistic labels but also the overall concept of symbols. As a result, these impairments may influence their understanding of non-linguistic symbol systems.

Social interaction as a mediating variable in the development of theory of mind:

Social constructivists argue that children come to understand the mental world through participation in linguistic and social exchanges. Therefore, increased interaction and more frequent mentalistic conversations not only enhance language proficiency but also foster the development of mentalization processes and Theory of Mind (ToM).

While Late Talking (LT) children are characterised by delayed expressive language abilities, the impact of these delays on their receptive language skills is variable. One proposed explanation is that children who speak less encounter fewer opportunities to engage in social situations *(Cheung et al., 2002)*. This could suggest that it is social interaction that contributes to ToM development, rather than language.

Cheung et al. further suggest that expressive language delays may reduce opportunities for children to learn how verbal labels are employed to scaffold picture comprehension. Research indicates that caregivers of children with expressive language delays provide less complex recasts *(Conti-Ramsden, 1990)*, as well as fewer expansions, less self-directed speech, and fewer general responses *(Vigil et al., 2005)*. This observation suggests a diminished level of scaffolding from caregivers, which may extend to mentalistic conversations, potentially leading to inhibited development of Theory of Mind (ToM). This indicates lower levels of overall scaffolding and social interaction rather than solely reflecting the impact of reduced linguistic scaffolding. Consequently, this underscores the significance of caregiver guidance and social interaction in contributing to the development of both language abilities and the emergence of ToM, thereby indicating a correlational rather than causal relationship between language and ToM where language could play a mediating role.

In addition to this, *Cheung et al*. propose that social abilities may serve to mitigate delays associated with expressive language deficits, including the development of Theory of Mind (ToM). Toddlers may benefit from social scaffolding even when their expressive vocabularies are underdeveloped, suggesting that children with stronger social skills may demonstrate enhanced linguistic competence and superior ToM abilities.

Investigations studying bilingual children serve as another example of how social factors may influence language proficiency and ToM development. Bilingual children have consistently outperformed their monolingual counterparts in terms of Theory of Mind (ToM) abilities and empathy skills. Research indicates that bilingual children not only perform complex language tasks with greater accuracy than monolinguals, but also demonstrate a deeper understanding of irony *(Chen & Fang, 2022)*. While this evidence is frequently cited to support the notion that language facilitates ToM development, it is crucial to consider the potential influence of social interaction as a third mediating variable. Because the enhanced empathy observed in bilingual individuals can be attributed to the close relationship between language and culture. Consistent exposure to multiple languages and cultures fosters their empathic abilities, as these children learn to navigate and negotiate between two distinct cultural contexts, thereby enhancing their perspective-taking skills. Furthermore, for learners acquiring a second language (L2) at a later age, it can be argued that individuals with higher empathy are more inclined to embrace a new culture and language *(Muzi Chen & Yuqi Fang, 2022)*, also perhaps implying individuals with higher empathy are *better* at acquiring L2. This suggests that while language and ToM may be correlated, cultural and social factors, such as bilingualism, could serve as mediating influences in this relationship. This is especially possible as language can be understood as a *medium* of interaction with culture that supports ToM, rather than as an independent factor aiding ToM.

Theory of Mind as a causative/predictive factor of language development:

Navneet Chopra (2013) proposes that, logically, Theory of Mind (ToM) must serve as a foundational condition facilitating language acquisition in infants and children. He cites recent studies indicating that ToM is not a discrete module but rather a composite of multiple lower-level and higher-level cognitive tasks and activities. These tasks include eye-gaze tracking, joint attention, imitation, recognizing goal-directed actions, and parsing behavioural streams into intention-relevant units *(Malle, B. F., 2007)*.

Importantly, these skills do not necessarily reflect reasoning about mental states *(Penn & Povinelli, 2001)*; instead, they can be viewed as precursors or early forms of mental-state inference—though such precursors are likely essential for the subsequent development of well-formed ToM. This perspective could also

clarify the ambiguity in neuroimaging research on ToM, which often reveals confusion regarding the specific brain regions involved. The activation of multiple regions could suggest that the various relatively independent functions contributing to ToM are grouped together under the umbrella of this construct.

He argues that in order to comprehend the meaning of any word, one must have an understanding of the mental states and intentions of others; therefore, ToM is a requisite for communication through language. Quoting *Tomasello*, he posits that any development of vocabulary without prior ToM is not unlike a parrot echoing words without meaning—similar to some children with Autism Spectrum Disorder (ASD) who, despite possessing a certain level of language ability, sometimes use language in an imitative and repetitive manner.

One explanation for the language deficits observed in individuals with ASD is that even infants and children may lack the affective inclination to engage with the social world; for instance, infants may not consistently look at their mothers' faces. This suggests that apathy towards social interaction can occur developmentally prior to language deficits, indicating that ToM cannot develop in the absence of an interest in mental states, which in turn contributes to underdeveloped language skills.

Chopra also cites the case of feral children, such as Genie *(Fromkin et al.,1974)*, and hypothesises that the deprivation of human interaction results in the failure to acquire Theory of Mind (ToM) abilities and an understanding of mental states. Consequently, these individuals struggle to learn language, especially beyond the telegraphic stage, even when provided with considerable support.

He concludes that although ToM must precede language development, and even pave the way for language development after a certain stage, they may both cyclically support each other, in terms of the Vygotskian idea of language scaffolding.

To further support this argument, another study has demonstrated that children as young as 15 months possess a representational Theory of Mind (ToM), albeit in a rudimentary and implicit form. This is in contradiction to the majority of previous studies including an extremely influential one by *Baron-Cohen, Leslie and Frith 1985*, that demonstrated children under four years old struggle with theory of mind. It has been suggested, by *Onishi and Baillargeon*, that these previous studies indicating that young children fail false belief tasks may be attributed to excessive linguistic, computational, and other demands placed on them. This assertion is corroborated by a modified non verbal false belief task, which employed simpler probing techniques by the experimenter, allowing children to succeed in the false belief task.

Additionally, the study assessed the understanding of false belief in 15-month-olds using entirely non-verbal techniques to observe their ability to predict an actor's behaviour based on their true or false belief about a toy's hiding place. The findings revealed that even very young children possess a rudimentary understanding of goal-directed behaviour, enabling them to predict actions and comprehend false beliefs, thereby demonstrating a degree of ToM *(Onishi & Baillargeon, 2005)*. This evidence supports *Chopra's* assertion that ToM develops prior to language acquisition.

Non verbal linguistic cues play an important role in effective communication. Intonation, for example, is important not only in conveying linguistic information (like syntactic constituency) but also pragmatic information (how the context affects meaning), polite discourse and speaker belief states. As a result, difficulties associated with intonation can affect comprehension and cause communication mishaps *(Cassilas et al., 2022)*. Recent studies have suggested that the interpretation of intonation is strongly correlated with empathy of the listener.

Jun and Bishop (2014) assessed the autistic traits of typically developing adults and found a correlation between these traits and their utilisation of intonational cues for syntactic processing. In a subsequent

study, *Bishop (2016)* discovered that pragmatically skilled, high-empathy individuals effectively employed features such as accent, pitch, and prosodic prominence to differentiate between high versus low attachment relative clauses High attachment clauses, are relative clauses that refer to the higher noun phrase in a sentence, and low attachment clauses correspond to the lower noun phrase in the sentence. For example, in the statement *"The son of the teacher who was always late"*, the relative clause *"who was always late"* refers to the higher noun *"teacher"*). In contrast, less pragmatically skilled, low-empathy individuals tended to rely on subsequent boundary tone and durational information *(Esteve-Gilbert et al., 2020).*

Initially, it was suggested that highly empathetic individuals were more sensitive to the processing of intonation in linguistically ambiguous situations. However, it was later found that they also paid greater attention to the processing of unambiguous yet critical words, likely to account for alternative perspectives. Notably, the effect of empathy was significantly stronger in contexts of linguistic ambiguity. Specifically, individuals with high empathy varied their looking behaviour (the cues one is looking for) based on intonational cues, while those with lower empathy did not. This indicates that individuals with higher empathy are more attuned to intonation cues when forming sound-meaning associations. In conclusion, individuals with greater pragmatic skills (higher empathy) appear to utilise intonation to resolve lexical ambiguities. *(Esteve-Gilbert et al., 2020; Casillas et al., 2022).* This could suggest that those with higher empathy (and by implication a more developed ToM) are capable of more effective communication owing to their sensitivity in perceiving intonation.

Casillas et al. investigated the impact of empathy on learning a second language (L2) and found that individuals with higher empathy and greater pragmatic skills utilised more information to reach decisions, albeit at a slower rate than their lower empathy counterparts. Their findings indicated that while response accuracy to yes/no questions was influenced solely by language proficiency, responses to wh- questions were significantly modulated by empathy. Specifically, higher empathy individuals with low proficiency demonstrated greater accuracy than their lower empathy counterparts at the same proficiency level. This suggests that heightened empathy can influence the rate of L2 development and that individuals with higher empathy may acquire L2 prosody at earlier stages than those with lower empathy.

Since empathy is a component of Theory of Mind (ToM), it can be inferred that ToM functions—such as perspective-taking, intentionality, and mentalizing—are essential for efficient and effective communication through language. For instance, these functions facilitate the interpretation of context-dependent cues and intonation, which are critical for understanding homophones.

Can ToM and Language be independent of each other? Evidence from non-human primates:

Tomasello and Call (2008) studied Theory of Mind (ToM) in chimpanzees. They found that, like humans, chimpanzees comprehend others' actions in terms of not only observable behaviour but also underlying goals or intentions. In competitive situations for food, chimpanzees demonstrated an awareness of what their competitors could and could not see, hear, and know. The researchers suggested that chimpanzees possess an understanding of both the goals and intentions of others, as well as their perceptions and knowledge states.

Jane Goodall (2017) noted that chimpanzees exhibit the capacity for empathy, as evidenced by their behaviours in looking out for one another and adopting young orphaned individuals. Additionally, compassionate behaviours were noted when they comforted distressed group members through actions such as hugging and grooming.

Both *Tomasello* and *Goodall's* research on chimpanzees suggests relatively advanced levels of Theory of Mind. However, researchers such as *Friederici* contend that while apes like chimpanzees can communicate with one another, they do not possess a true language. Although they are capable of associating words and phrases with abstract concepts, similar to the capabilities observed in parrots and dogs, *Friederici* argues that this is not classified as language. She explains that, unlike humans, who exhibit highly developed brain regions for language, specifically Broca's and Wernicke's areas, only the rudimentary structures of these regions are observed in apes. In fact, the structural characteristics of these regions in apes can be compared to those found in human infants.

Evidence of chimpanzees demonstrating Theory of Mind (ToM) without possessing a true language suggests that ToM and language ability may be cognitively independent functions. Given the similarities between non-human primates and humans, this could indicate that ToM and language are also independent cognitive functions in humans. Although there is a correlation between the two, their comparable trajectories—exemplified by individuals who possess both (such as typically developing individuals) or lack both (such as those with Autism Spectrum Disorder)—may suggest the influence of a third variable, such as social factors. Nevertheless, this does not negate the possibility that ToM and language function as distinct cognitive abilities.

What Neurology suggests:

The Mirror Neuron System (MNS) is a recent discovery in neurology. Rizzolatti and colleagues, while investigating neurons associated with executive functions, discovered that certain neurons fire not only when individuals perform actions but also when they observe those actions. This capability highlights the MNS's fundamental role in action understanding, facilitating the conversion of observational information into knowledge. Additionally, mirror neurons are employed in the imitation of both novel and familiar actions *(Rajmohan and Mohandas 2007)*.

Furthermore, the Mirror Neuron System (MNS) has been found to be associated with language, as mirror neurons have been identified in Broca's area—commonly understood as a region responsible for language processing. This finding suggests that language may have evolved from gestural imitation. Theory of Mind (ToM) processes, such as mentalizing, perspective-taking, and understanding non-verbal communication, are linked to action imitation and intention understanding, which are also functions attributed to the MNS. Additionally, brain regions associated with ToM, such as the medial prefrontal cortex, have also been found to contain mirror neurons. Functions of ToM, including social communication and empathy, are similarly associated with imitation, with mirror neuron activity playing a critical role in social mirroring *(Rajmohan & Mohandas, 2007)*.

This evidence supports the notion that, given the overlap of neural regions responsible for both language and ToM, which are both regulated by the MNS and rely on imitation to some extent, these constructs may represent similar cognitive functions. Therefore, it is plausible to assert that they are correlated and may even exert mutual influence on one another.

Broca's area in the brain is integral to the expressive aspects of both spoken and written language, and it has been linked to grammatical structuring and syntax. Recent research suggests that Broca's area plays a crucial role in coordinating the transformation of information processing across extensive cortical networks involved in spoken word production, prior to articulation *(Flinker et al., 2015)*. Broca's aphasia, a language impairment typically resulting from traumatic brain injury to Broca's area and its surrounding regions, is characterised by a significant reduction in the production of spontaneous speech and a loss of

grammatical structure. Specifically, individuals with this condition often struggle with the use of linking words, such as conjunctions and prepositions. Additionally, there is notable difficulty in repeating phrases, which may be attributed to damage within the Mirror Neuron System (MNS).

Tatsiou (2019) conducted a study comparing patients with Broca's aphasia to a neurotypical sample to assess their Theory of Mind (ToM) capabilities. Utilising nonverbal techniques—given that language impairments in aphasia patients may interfere with standard verbal or written ToM assessments—the study evaluated participants' understanding of false beliefs. The findings revealed that patients with Broca's aphasia scored significantly lower on the false belief test compared to their neurotypical counterparts, indicating impaired ToM abilities. Additionally, Broca's aphasia patients exhibited delayed reaction times on average relative to the neurotypical sample, suggesting slower and more effortful cognitive processing. These results underscore the importance of Broca's area in facilitating both language and ToM. The observed impairments associated with damage to this region suggest that both functions may rely on overlapping neural substrates. Consequently, it can be inferred that ToM and language not only exhibit cognitive similarities but may also develop (or fail to develop) synchronously, further supporting the notion that the two functions of language and ToM, may be underpinned by the same cognitive functions.

Conclusions, discussion and implications:

Language and ToM are intrinsically connected. There is plenty of evidence supporting the role of language in the development of ToM, and other higher order thinking. However ToM as a predictive factor and prerequisite for language seems logical in the argument that understanding of mental states is necessary for effective use of language. And faculties like joint attention, part of ToM functions, form the base on which conversation and language develop. Perhaps it can thus be suggested that ToM is a prerequisite that must developmentally precede language,and it plays a critical role in the development of language proficiency and acquisition.

At the same time both theories do not necessarily contradict each other. While it can be true that ToM is a prerequisite, it is very possible, and there is evidence that after a point, both simultaneously contribute to the other's development. This could be argued as overall higher intelligence. The relationship between ToM and language can be understood as two appendages of the same body that cannot effectively function without each other.

Neurological studies indicating similar regions are used to operate both functions together also suggest that impaired usage of both can be due to injury in the region, meaning better adeptness at both could simply suggest higher intelligence and better functioning of that region.

It is also important to consider recent studies that understand ToM not as an independent cognitive function but as an umbrella term for many functions, this could also suggest that similar smaller cognitives functions used for ToM are used for language, explaining their correlation and why people are either more skilled at both functions or lacking in both. This is supported by neurobiological studies that highlight the use of the same regions, suggesting the same cognitive functions used for what is conventionally classified as distinct cognitive abilities of language as ToM. It is possible that although they manifest differently in behaviour they rely on the same basic cognitive functions. Further research on the similar brain regions activated for language and ToM functions is required for clearer understanding.

It is necessary to understand language and ToM functions not in their social roles like empathy and understanding sarcasm, that are broad classifications often involving a number of smaller cognitive faculties, but in terms of basic cognitive functions like eye tracking and perhaps memory and word association. Research investigating such individual cognitive functions rather than umbrella terms of

language and ToM could perhaps reveal more about the connection between the two. Furthermore, the operationalisation of ToM understanding is also questionable as false belief understanding is only one of many ToM functions, while others like emotion recognition and attribution are often ignored in testing. This indicates the need for further research in more specific topics such as specifically understanding the influence on vocabulary and emotion attribution. Research should focus on isolating the individual components of language and ToM to discern which aspects are most interconnected and how they influence each other.

Furthermore, early deficits in ToM followed by language deficits, can either be a result of deficits in the same underlying cognitive ability or brain structure, or it could be the lack of ToM development, which causes a lack of base for language to develop. Although more research regarding this is required, the former seems more likely. Longitudinal studies, focused on understanding where the developmental trajectories of ToM and language converge and diverge can be conducted for better understanding.

All of this can be true, without discounting the role of social and cultural interaction and the development of both language and theory of mind. Language being used, more often than not in conversation, makes it inextricably entangled with social interaction. Further research is required to understand what parts of language specifically are influenced by ToM as compared to skills relating to social interaction. It is possible that language proficiency features like intonation understanding are actually social interaction functions rather than purely language functions like vocabulary size. Different features of language need to be isolated and investigated in relation to theory of mind. It is very possible that features vocabulary and syntax affect and are affected by ToM differently based on their relationship with social interaction.

Research in this field is particularly important for speech-language pathology. For example Tatsiou's research found that Broca's aphasia cause not only language impairment but also impairment of ToM. When the study was published, patients with Broca's aphasia received only speech therapy whereas therapy to aid ToM development was not given, which could have improved their condition. Similarly, research from Late Talking children indicates that environments lacking in rich linguistic and social stimulus could lead to ToM deficits, highlighting the importance of ensuring the presence of both of these in their environments. This is also true for deaf children in hearing families, their later exposure to language can cause ToM deficits. This has far reaching implications in special education, where such concerns can be flagged early and worked on during the critical period, that is pre-puberty.

Similarly, research in this field of psycholinguistics points to the importance of social and cultural awareness in therapeutic interventions. For example, bilingualism may be promoted when educating children lacking in ToM, to enhance empathy, or it could be a suggested lifestyle for those at genetic risk of conditions that involve possibilities of inadequate ToM functioning.

Precursory ToM deficits in infants, likely to cause or predict later language deficits in children can also be identified through more research. Flagging and predicting this can help early intervention and engagement in therapeutic processes that will support ToM development that will form the base for Language, to avoid developing language deficits in the first place. Research in this area can further our understanding of autism, and if by early intervention in the treatment of some symptoms, other symptoms that develop as a result of a lacking base can be prevented.

Furthermore neurobiological research on structural differences in receptive versus expressive speech disorders, with investigation in regions associated with language and ToM can reveal more about how ToM and language affect each other. This would evidently be useful in the treatment of speech disorders.

In conclusion, the relationship between Theory of Mind (ToM) and language appears dynamic and mutu-

ally reinforcing rather than strictly hierarchical. While ToM likely serves as a cognitive foundation for language, language development also enhances ToM abilities. Neurological evidence points to shared brain regions and cognitive processes, suggesting common underlying mechanisms. Further research should focus on isolating specific cognitive functions to clarify the nature of this connection, considering the influence of social and cultural contexts.

This understanding has significant implications in speech-language pathology and special education. Personalised interventions that address both ToM and language skills could enhance therapeutic outcomes, particularly for individuals with developmental or acquired impairments. Research advancements in this area could enable earlier interventions, promoting better outcomes in language acquisition and social-cognitive development across culturally diverse populations.