
A Study on the Relationship Between Language and Mind

Ping Qu

Department of Foreign Language, Lishui University, Lishui, China

Email address

pingyuanmei686@163.com

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Abstract: The relationship between language and mind has been attracting more and more attention from experts and scholars. In this paper, non-human primates, normal children and special groups are the object of discussion. There is a deep analysis about the relationship between linguistic ability and psychological phenomena from the perspective of comparison and development of studies in this field. It is found that a certain linguistic competence may be a prerequisite for the passing of the psycho-theoretical test, but the two have different developmental laws and show complicated coexistence.

Keywords: Language, Mind, Theory of Mind, False Belief, Verbal Tasks and Nonverbal Tasks

1. Introduction

The Theory of Mind (ToM) refers to the ability of an individual to understand his or her own mental state, such as intention, desire, belief, etc., and based upon those conditions to interpret and reason for others' mind and behavior. Since Premack & Woodruff [1] first put forward this concept, it has become one of the hot research fields in developmental psychology. The subjects of study focus on normal children's mastery of the theory of mind, including the stages and levels of the development of the theory of mind, and the rules of children's understanding of different levels of mental state. The methods used in the study were mainly classical misconception tasks designed by Perner & Wimmer [2], such as unexpected content or change of location tasks, and the later studies mostly used this paradigm or its variants. The task is to provide children with a story (or with a puppet presentation and related pictures), such as the Sally-Ann task, and ask them to answer questions about misunderstanding. The logic of the study is that if a child can answer a question correctly, he must recognize that he or she may have false beliefs, and that others may have beliefs different from his or her own, indicating that children have a theory of mind. Studies show that children get the ability of theory of mind at the age of 4. However, there are different opinions on the interpretation of the experimental results, because the erroneous tasks used in the laboratory are mainly verbal tasks,

including children's ability to understand and answer stories and questions, so children's failure to complete the tasks may be a language disability. Although some researchers attempt to design so-called non-verbal tasks, it is difficult to eliminate the ability factor that subjects have mastered language and try to represent objective things with language, so the design and implementation of non-verbal tasks become very difficult. Therefore, this has led to the study of the relationship between theory of mind and linguistic competence, and has become an important aspect in the study of the relationship between the theory of mind and other factors.

2. Linguistic Competence - The Basis for the Full Development of the Theory of Mind (ToM)

Astington & Jenkins [3] claimed that there may be three cases in the relationship between the theory of mind and language ability: (1) language ability depended on the theory of mind; (2) language is the premise and foundation of the theory of mind, that is, the theory of mind depending on language; (3) these two may depend on the third other factors, such as working memory and executive control function. At present, most of the studies on the relationship between the two belong to a related study, that is, measuring children's language development level and ability, and children's completion of the task of misconception, and then calculating

the correlation between the two.

Jenkins & Astington [4] has studied the relationship between general syntactic and semantic competence and misconception comprehension of 3-5-year-old children. It is found that children need to reach a certain level of language ability to pass standard misconception comprehension tasks. After reaching this threshold, there is a certain relevance between language ability and misconception comprehension. In 1999, they conducted another longitudinal study of the relationship between language and the theory of mind. The early language development scale was used to test the language development ability and proficiency of 59 3-year-old and 4-month children. The children's psycho-theoretical ability was measured by unexpected content, change of place and appearance-reality tasks. These two tests were carried out thrice in 7 months. The results show that there is a high correlation between the test scores of the theory of mind and language proficiency. Children's general language proficiency (especially their syntactic proficiency) can predict the development of the theory of mind, but the opposite prediction is not true. They believe that language is indispensable to the fulfillment of the task of theory of mind, and language plays a fundamental role in the development of the theory of mind. In conclusion, this experiment confirms second hypotheses.

However, Charman & Baron-Cohen et al. [5] in their studies of "Joint Attention", "imitation and play", "language and theory of mind", found that 44-month-old children's receptive language and expressive language were positively correlated with the theory of mind, but not significantly. Receptive language was not positively correlated with the theory of mind at an earlier time, but was negatively correlated with the theory of mind at 20 months, even after IQ was excluded. This is inconsistent with the results of Astington et al. Our idea is that children's language ability will encounter floor effect in psychometrics when they are under 18 months old. This may be a limited problem when testing the theory of mind and linguistic relationship of the young children. How to measure children's linguistic competence directly is a key to further study. It is generally accepted by most people that in the test of misconception comprehension based on speech tasks, it always depends on certain language abilities. But we can't simplify the relationship between language and the theory of mind as a model of "who depending on whom". Perhaps there is a more complex relationship between the two at a deeper level. Children's mastery of vocabulary and syntax begins before their maturity of theoretical ability. The development of children's linguistic ability promotes the understanding of misunderstanding, because this enables children to more clearly express the state of this belief. The failure to pass the "Misconception Task Test" before the age of four may be due to a lack of understanding of the nested form of sentences, or because children do not understand the relationship between the object and the representation of the object [6].

There are researchers [7] who believe that children can pass the second-level misunderstanding test when they are about the age of six, which indicates that children have developed

mature theoretical ability. However, there are great individual differences in the normal development of the individual's understanding and prediction of other people's mental state, as well as the ability to respond appropriately. In this case, what is the relationship between the individual's linguistic competence and the ability of the theory of mind? The relevant research on this issue is still on the way.

In addition, Sabbagh & Baldwin [8] studied the relationship between the development of theory of mind and semantic competence of the preschool children who have an average age of 3.3 and 4.3 years. They asked children to learn new words under two conditions: one condition was that the adults who participated in the game, i.e. the experimenters, showed a state of familiarity and understanding of the new words; the other condition was that the experimenters showed an ignorant or unfamiliar and uncertain state of knowledge. The results showed that the children's learning effect was remarkably good under the former condition. This proves that children can take into account the adult's knowledge state and psychological theory when establishing the relationship between words and their denotations, and the psychological theory does have a certain impact on the learning of words. According to this experimental study, we can analyze why teachers should ensure the scientific and ideological nature of knowledge in their teaching. One reason is that young children tend to help their learning according to their psychological state and intelligent expression in establishing the connection between words and their referents or meanings.

Some of the above studies reveal that children must have certain linguistic competence, including verbal mastery and grammatical comprehension, in order to fulfill the classical misconception task of measuring psycho-theoretical competence. However, in the understanding of environmental events, language is only one of the more important used representations. What is the relationship between the development and operation of linguistic competence and theory of mind before and after the language has fully developed and reached a high enough level?

3. Theory of Mind and Developing View of Language

The above researches on the relationship between the theory of mind and language are mostly described from a certain point of development, but each of them has a process of development. From non-human primates to humans, does the "language" communication system have continuity? Does chimpanzees have a theory of mind? When did children begin to develop the theory of mind? Perhaps the analysis of these problems from the perspective of comparative psychology will help us to understand the occurrence and development of the theory of mind. It is also possible for human individuals to discuss them from the perspective of the development of linguistic and psychological theories and to find out the dynamic relationships among them in terms of laws, mechanisms and functions.

3.1. A comparative Study of Language Communication System and the Theory of Mind (ToM)

“Does chimpanzee have a theory of mind?” This question was asked by Premack & Woodruff [1] when they first proposed the concept of theory of mind, which has been studied and debated for more than 20 years. Studies on the seven out of eight chimpanzees during the time from 1973 to 1996 claimed to have found evidence that chimpanzees were psychologically attributable [9]. However, Call & Tomasello [10] used verbal and nonverbal tasks to test the ability of children and apes (2 adult yellow chimpanzees of the seven ones) to understand misunderstanding. The results showed that in both tasks, the correct response rate of 5-year old children was more than 80%, while none of the seven apes passed the test. The experiment did not support the apes’ inferring ability of attribution.

Studies on Chimpanzee’s intelligence and training them to learn human languages have been experimented for many years, but there is still much controversy about whether animals, especially primates, have a continuity in language development with humans. Chimpanzees, on the other hand, seem to have made people believe that it is only when human-like languages are involved that chimpanzees show failures in reasoning and attributing to their mental states. Gomez [11] used the hypothesis put forward by Baron-Cohen that there are two different mechanisms for understanding mental states: shared attention mechanism (SAM) and the theory of mind module (ToMM). Gomez believes that the gorillas’ and chimpanzees’ communicating system of "ostension and reference" is the function of SAM, which is different from that of ToMM. The apes’ anaphora component of communication may not require an understanding of mental purpose and belief, but involves only first-order representation and attention following. The so-called primary representation refers to the external performance of a psychological activity, such as an individual seeing a banana, then generating the eating behavior. It is only the physical language (physiognomic) associated with the attitudes of the actors in the target or target of psychological activities in the environment. It achieves its goal through the SAM mechanism. The elements of "referring" do not need ToMM, so are the human adults even. Therefore apes can perform "ostensive referential" communication without the need for language acquired device system (LADS) or ToMM, only SAM is enough.

With non-semantic vocalization, babies often use this representative mechanism when referring to something, and even if meaningful words appear later, the support of this mechanism often exists. After children have mastered the language, they have acquired the ability to use grammar. According to Chomsky, the greatest feature of human language is its creativity to create an infinite amount of content with limited elements. Gomez believes that this creativity mainly comes from the SAM mechanism in the process of purposeful communication and the adaptability of

grammar to this producing system. Grammar and syntax enhance the creativity of this system. For example, it can enhance the representation and reasoning ability of human thoughts and promote the emergence of a special thinking mechanism. However, he also believes that the theory of mind and language acquisition device system (LADS) are two independent systems involving different mechanisms, although they are closely related. If viewed from the perspective of grammar and semantics, human language is indeed unique, and no language pattern similar to human language has been found in other animal populations. If other species had language, it may be that language is a kind of communication system in a wide sense. Human beings have rich semantic systems and ideological functions, complex social systems and lifestyles, which are inseparable from the developed language of human beings. It can be seen that many experimental studies believe that it is reasonable for other animal populations, including non-human primates closest to humans, to have no theory of mind.

3.2. Individual Development of Linguistic Competence and the Theory of Mind (ToM)

Studies have shown that children can understand people's wishes and goals at the age of 3. Around the age of 4, they can understand more complex mental states, when they are at the age of 6 and a half, they can pass the test of first degree misunderstanding, and understand second degree misunderstanding [2, 7]. Astington believes that the normal children can have the theory of mind when they become one year old, such as showing goal-directed behavior. However, according to the concept of theory of mind, even if young children can point to an object together with other people's attention, it would be insufficient to say that the young children can make predictions and reasoning on this basis. The children’s language development seems to be earlier than the development of the theory of mind, and its potential development and progress seem to be stronger than the latter. Because children at the age of four can understand the first degree of misunderstanding, but their actual language skills have developed to a higher level, regardless of their vocabulary, their syntactic ability and their ability to flexibly use grammar to express ideas and communicate. The potential and characteristics of human individual language learning in a normal language environment are unparalleled. It shows that the development of the theory of mind and language ability do have different laws. Language is a major tool for people to express their thoughts and communicate with each other. It is an artificial symbol system used to represent the objective world, including the internal consciousness. Whether the theory of mind is classified as a social cognitive ability or merely a reasoning system in social interaction, it must form a series of representations of the relationship between objects, as well as people's understanding of the relationship. Since language is a highly structured and systematic tool for symbolic representation, it is most likely that language is the first tool for understanding mental states.

In about 1980s, Fodor [12] put forward the hypothesis of "the language of thought" (LoT). He believed that the states of intention and belief are the psychological and physical representations of the brain, and they are the motivations of behavior. These states have similar organizational structure characterized as objects of being thought. This kind of thinking language is a kind of innate mental language. Individuals must carry out operations of rational symbol system in psychological media. The theory of mind can be seen as a set of modules characterized by their interrelated functions, such as encoding information by psychological representation in linguistic form. Despite some controversy about this theory, we do often use such psychological language when expressing a coherent state of belief, such as "Johnson believes I am a doctor", which is a propositional representation. According to Fodor [13], representations can be consistent or inconsistent with objective reality. When inconsistent, false beliefs occur. Why there are failures in the test of ToM? A 3-year-old child knows the state of representation, but he/she may do not know the state of the false representation. Therefore, the understanding of objective things and their relationships in the misconception test is based on whether or not the desire is directly satisfied, and the failure to understand oneself and others may be based on a wrong state of knowledge. In the study of children's comprehension and misconception test of stories with vague context clues, Kamawar & Olson [14] proposed that children's comprehension of words and beliefs was similar before and after the development of their meta-representational ability. Before the development of meta-representational ability, belief corresponds to the actual state of the object event, words corresponding to the actual referent; after the development of meta-representational ability, psychological representations appear in the connection between belief and the actual state of the object, which is manifested in the connection between words and referents. Then children can know that the object and its relationship can have different forms of representation, can have incorrect representation, and different people can have different states of representation. The development of words and beliefs seems to follow similar tracks.

Perner [15] suggests that the representation of mental ability is different from the perceptual representation of general events, but a meta-representation. This meta-representation, he argues, controls the tendency to not react in behavioral responses, which is developed in conjunction with the child's mind-theoretical abilities. It can be seen that the state of representation in the theory of mind is similar to the cognition of cognition and the representation of representation. This condition makes the individual have a dynamic perception of themselves and others' thoughts and consciousness. So this ability is especially important for people to correctly perceive themselves and the mental state of others (including desires, intentions, beliefs, etc.) in making predictions, reasoning as well as correct and logical responses. But what is the relationship between the representation of language and the representation of the theory of mind? Is language only a medium or tool of the representation of the

ToM, or an indispensable component of the representation of the ToM? There is no definite answer to this question. Segal [6, 16] holds that the representation of psychological attitudes can be both language-dependent and language-independent. So when does this representation need no language? And how does this representation form? All these problems need further study.

To sum up, the development of linguistic competence is inconsistent with that of mind-theoretical competence. They have different developing processes and laws. Language is only a major tool for people to communicate and represent the world. The capacity of mind-theoretical competence is a mind mechanism for people to survive and live normally in nature and social system. So what if the development of language is one of the important conditions for the development of mind-theoretical competence, and the individuals with language developing obstacles, as well as those who have lost or partially lost their linguistic competence due to physical injury? How about their mind-theoretical competence and performance?

4. Is Language Necessary for the Existence of the ToM

Weiskrantz [12] argues that a scientific study of the relationship between thinking and language requires an understanding of what cognitive abilities exist in organisms that lack language. There are three types of language deficiency in organisms: (1) not yet acquired language (e.g. human infants); (2) lost language (e.g. patients with brain damage); and (3) unable to acquire language (e.g. non-human animals). Here we mainly discuss the study of children with linguistic retardation, impairment or aphasia.

4.1. Autistic Patients

DSM-IV defines autistic patients as their delay in communication and absence of spoken language, marked with impairment of their ability to initiate or maintain conversation with others, lack of spontaneous pretending games and early development. Autistic patients are slow in the development of communication and verbal skills. Barcon-cohen et al. [17] used misconception task to test the ToM of autistic children. The results showed that 80% of autistic children could not pass the test, and the failure rate was higher than that of the control group. They argue that autistic children cannot predict and explain people's behavior based on mental models of purpose, desire, and belief structure. Researchers have suggested that the inability of autistic children to perform misconception tasks and other tasks related to mental representation may be related to their language ability [18, 19].

There is a systematic correlation between representational theory of mind and language ability. The results suggest that the success of tasks of representational ToM (such as tasks of false belief) depends on verbal mental age (VMA) [18]. Happe argues that VMA in autistic individuals can not pass

tasks of representational ToM if it is below a specific point Y, but if it is above a specific point X, it passes. Smith & Tsimpli [20] argues that the correlation between the ToM and language occurs only when language is a necessary medium for expressing mental states. So, if representation of the ToM involves language only when the expression must be mediated by language, the separation of the ToM from language should be found.

4.2. Children with Specific Language Impairments and Aphasic Patients

States of mind are often expressed in words, such as verbs complemented with a clause. If misunderstanding requires language competence in the test of the ToM, it is difficult for the same aged children with language impairment to achieve the same level in task operation. De Villiers [21] once thought that the complementary form of this nested sentence provided a computer system for mistaken ideas. The relationship between the ToM and language can be divided into strong and weak forms. The former refers to the representation of mental state and must have certain linguistic competence; the latter refers to the fact that misunderstandings are presented in language, so it is necessary to achieve a certain level of linguistic proficiency to pass the test.

Miller (2001) [21] used different experimental conditions to test the weak relationship between misconceptions and language proficiency. The subjects were divided into three groups; one group was 10 children with special language impairment (SLI), aged 4.5-7.1 years. The other two groups were age control group (NDA) and language ability control group (NDC). There were 10 children with normal language ability in age control group, aged 4.6-7.2 years. The average age of nine children in language ability control group was 3.9 years. There was no significant difference between language proficiency and group SLI. There were two tasks in the test of the ToM. One is the task of changing position. There are four conditions: the verbs used in the question have four words: "think", "look for", "show", and "pretend". It was found that SLI group had significantly worse performance than NDA group in terms of higher language requirements, while SLI group had significantly better performance than NDC group in terms of lower language proficiency requirements. Researchers believe that language requirements are an important factor in misconception testing. Experiments verify the weak relationship between language development and the ToM. The other is the study of aphasic patients. Aphasia is a disorder caused by organic encephalopathy in use or expression of language symbols. The research on aphasia patients mainly uses surgical operation and neuroanatomical techniques, such as CT scanning, to confirm the location of brain injury, and psycholinguistic scales to measure the psycholinguistic ability of the subjects, so as to determine the types of aphasia suffered by the subjects. The subjects were tested by the ToM, causal reasoning and other related language proficiency tests. Then, the situation of the completed task was analyzed. Most of them are case studies. To a certain extent, the separation of language and cognition

does not mean that language, cognition and thinking are irrelevant [22]. On the contrary, in most cases, we use grammatical language to convey ideas and understand others. Relevant experimental studies indicate whether there are other complementary mechanisms after we have mastered language which has become the main tool of thinking, cognition and communication, and whether the relationship between language, cognition and thought, especially the relationship between language and the ToM discussed in this paper, are more complex and need more research.

5. Conclusion

A certain degree of correlation between the abilities of the ToM and language has been measured by using tasks of misconception. The children who have a certain linguistic ability can only pass testing task. This shows that linguistic ability is perhaps the basis of the development of the ToM, and the mature linguistic ability for people to understand the objective things provides them with a powerful tool to understand others' mental states. The research on the normal human subjects and autism, specific language impairment in children and patients with aphasia shows that they may have different developing rules of language and the ToM, though they seemly follow a similar path.

However, there are still some problems in the current research. Firstly, most of the tasks to measure the ability of theory of mind are speech tasks. Even though some tasks are non-speech tasks, it is difficult to completely eliminate the influence of language in the process of implementation. The research on children at different stages may produce different results, which may be due to the different dependence of the ToM on language ability at different stages of development. Some scholars believe that in some cases there exists a separation between the theory of mind and language. It is a question that needs further discussion. Second, how to measure whether there is internal speech in the study and what role it plays. Compared with the external language, its mechanism may better reflect the characteristics of the operation process of the theory of mind. Thirdly, in the roles of linguistic competence and the ToM, what is the proportion of autonomous control and automated operation respectively?

To sum up, future research should be done on the special population such as aphasia patients, and more considerations given to the role of language in the individual's perception and states of mind, exploring the relationship between linguistic ability and the ToM in the process of an individual development from a broader psychological level. Perhaps this study of the relationship between the ToM and language will contribute to a deeper understanding of the ancient proposition philosophically and psychologically.

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