



# ***Psychological Lexicon and Theory-of-mind: Training Preschool Children to Improve their Social Cognition***

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### **Abstract**

*This paper focuses on the relationship between children's psychological lexicon and their development of social cognition as assessed through theory-of-mind and emotion understanding tasks. It provides a brief overview of the topic, describes our own previous data, and reports new findings with a larger sample. Participants in our latest study were 102 children of 3, 4 and 5 years of age, randomly assigned to training or control conditions. All the children were pre- and post- tested with linguistic and cognitive measures to assess their language ability, mental-state talk comprehension, false-belief understanding and emotion comprehension. During the intervention, participants in the training condition were read stories enriched with psychological lexicon and took part in language games and conversations aimed at stimulating the use of inner-state terms. As expected, they outperformed the control group at post-test on most of the administered measures. The intervention brought about a stronger improvement in social cognition in the 3- and 4-year old participants. Educational implications are briefly discussed.*

**Key words:** psychological lexicon, mental-state talk, theory-of-mind, emotion understanding, training study, social cognition

### **1. Introduction**

This paper focuses on the relationship between language and thought, examining the link between linguistic competence and the development of social cognition as expressed through theory-of-mind (ToM) and emotion

understanding abilities (Harris, 2008; Hughes, 2011).

There is an abundance of data showing that language plays a crucial role in children's development of theory-of-mind (Milligan, Astington, & Dack, 2007) - a 'theory' that children develop at an early stage about the fact that people have mental or inner states which are not directly observable but nevertheless influence their visible behavior. Having a theory-of-mind allows children to attribute thoughts, desires, emotions, intentions to others and, consequently, to predict and explain their actions. Typically, one of the most important milestones in theory-of-mind development is acquiring the ability to attribute *false belief* (Wimmer & Perner, 1983).

To make correct false belief attributions, children must understand that people's beliefs are based on their knowledge, that mental states can differ from reality - as well as from one person to another - and that people's actions may be predicted on the basis of their mental states. In order to test children's theory-of-mind, numerous versions of the false-belief task have been devised: this is a task that children begin to perform successfully at 4 years of age when they are able to figure out how a person who holds a false belief about a certain state of affairs (for instance, the location of an object or the contents of a box) will behave.

In studying the linguistic correlates of ToM, particular attention has been devoted to psychological lexicon or mental-state language, a type of talk that past research has classified into a number of categories, including perceptual (e.g. sight, hearing), volition (e.g. desire, need), emotional (anger, fear, joy), affective (love), cognitive (knowing, thinking, believing), and moral terms (e.g., Bretherton & Beegly, 1982; Bartsch & Wellman, 1995).

Observational and naturalistic findings have shown that this type of lexicon allows children, from the second year of life (Bretherton & Beegly, 1982), to speak about internal states, that is to say, to refer to their own and others' thoughts, desires, emotions and feelings through utterances such as: 'Mummy happy..., Mark afraid...I don't want to...me sad...I want to see it..' etcetera. This kind of linguistic expression first appears in the context of everyday social interaction and conversational exchanges that involve the pragmatic use of language and foster interpersonal communication and reciprocal attention to inner states.

With regard to the link between mental-state language and children's understanding of the mind, research has been carried out using both longitudinal and training-study methods.

Longitudinal investigations were pioneered by the seminal *conversational studies* of Judy Dunn and her team which showed that children learn about

feelings, beliefs and thoughts and how to talk about such concepts in the context of *discourse among family members*. Empirical data has also shown that mothers' discourse and language about mental states is related to children's ability to understand inner states, while a number of studies have confirmed the finding that children from families in which desires and feelings are frequently discussed are more likely than their peers to succeed in ToM and emotion understanding tasks some months later (e.g., Dunn, Brown & Beardsall, 1991). Still other research has indicated that children's talk about mental states with friends and mothers predicts improvements in their false belief comprehension (Hughes & Dunn, 1998; Ruffman, Slade & Crowe, 2002). In addition, mothers' early use of cognitive verbs in picture-book reading has been found to be correlated with children's later understanding of mental states (Adrian, Clemente, Villanueva, 2007). Other studies have suggested that mother's explanations of emotional states in conversation predicts children's emotion understanding and false belief explanation (Dunn, Brown, Slomkowsky, Tesla, & Youngblade, 1991; Garner, Jones, Gaddy, & Rennie, 1997; Laible 2004). The large body of longitudinal data from this area of research allows us to draw reliable conclusions about the link between discourse and conversational practices with children and their later performance on theory-of-mind tasks.

Similar conclusions may be drawn on the basis of findings from experimental research. The link between mental-state language and ToM has also been explored through training studies. Experimental language-based interventions have indicated that language and conversation play a crucial role in developing children's understanding of mind and emotion. For instance, Appleton & Reddy (1996) used an 'explanation within conversation paradigm' with three year-old children, who were trained to explain the thoughts and actions of the protagonists of a series of video clips, with emphasis on the positive elaboration of their answers. Children who had received training outperformed control-group participants on a standard false-belief task. Guajardo & Watson (2002) manipulated 3- to 4-year-old children's exposure to social discourse, centered naturalistically around children's storybooks, to examine the implications for theory-of-mind understanding. The individual training sessions involved discussion of mental state concepts (e.g., intentions, false beliefs etc.) in the context of story reading. Each session began with a question to prompt the children to think about the relevant concepts and continued with intensive back-and-forth interaction, with the storyteller highlighting the characters' thoughts and actions, and asking the children to explain them. The findings provided further support for the hypothesis that social discourse influences children's theory-of-mind. Using a similar method, Lohman & Tomasello (2003) demonstrated that the use of mental-state verbs in discursive interaction contributes to improvements in children's social cognition. Specifically, the most effective intervention proposed by the authors combined two factors: presentation of a series of objects, some of which had a misleading appearance (e.g. initially looking like a certain thing, but then turning out to be something else), and verbal comments on what people would say, think and know about both the perceptible properties and actual identity of these objects. Tenenbaum, Alfieri, Brooks, and Dunne (2008) conducted a training study with children ranging in age from 5 to 8 years, showing that

explanatory conversations (in both self-explanation and experimenter-explanation conditions) facilitated their emotion understanding, a specific case of theory-of-mind and social cognition.

In addition, in a study with 5 to 10 year olds, Veneziano, Hudelot, Albert and Veyrier (2008) presented children with five wordless pictures and asked them to tell the story once the pictures had been removed. The intervention consisted of scaffolding the children through the activity by conversing with them, and specifically by asking to explain the events in the story. The authors found that the intervention significantly enhanced both accuracy of story-telling and level of reference to the characters' internal states, including their false beliefs.

We ourselves adopted the training-study method in two previous studies that drew on an earlier training study by Peskin & Astington (2004) which we now briefly outline. These authors examined whether exposing 4-year-old children to explicit mental-state terms in story texts resulted in advanced conceptual understanding of their own and other people's beliefs. The children listened both at home and at school to stories containing dramatically increased numbers of terms referring to mental states. The control group received the same books with no enrichment of mental states language, but with most stories requiring the children to think about alternative perspectives. Although the children in the training group displayed significantly higher mentalistic verb production in story-telling, their performance on a false-belief battery did not significantly improve. The authors suggested that hearing numerous inner state terms in stories (training group) may be less effective than having to construct one's own mentalistic interpretations of stories highlighting mental states (control group).

One interpretation of these results is that *passively* listening to stories with mental-state terms alone is not enough to significantly improve understanding of mental-state language or accelerate theory-of-mind development. In line with the *conversational and pragmatic hypothesis* on which the various training interventions described above were based, we assumed in our own work that the *active* use of mental-state terms in everyday conversations enhances children's understanding of internal states and mental lexicon.

In the first of our two previous studies (Ornaghi, Brockmeier & Grazzani, 2011), 70 children between 3 and 4 years of age, all native Italian speakers, were randomly assigned to an experimental-training group and a control group, with 35 children in each of the two conditions. The study was conducted in 3 phases: pretest, training and post-test. The pretest and posttest consisted of five individually administered measures: a language comprehension test, two first-order false-belief prediction tasks and one false-belief explanation task, a mental-state language comprehension task and a test of emotion comprehension.

During the training, children not only listened to stories enriched with mental-state language (see Pesking & Astington, 2004), but they also took part in language games. The researcher stimulated the children to use the target word as much as possible by means of focused questions or comments; he wound up the session, lasting on average fifteen minutes, after all the children in the group had played at using the target mental-state term. In contrast, after listening to the same story, the children in the *control group* were allowed to engage in free play and were provided with toys deliberately selected to minimize conversation amongst the participants. We found that training 3 and 4-year-olds in actively using mental-state language had a significant effect on their comprehension of mental-state language, emotion comprehension and false-belief understanding.

The second study (Grazzani & Ornaghi, 2011) used a similar research design but the training focused specifically on emotional-state talk and on the effect of the intervention on emotion understanding. A sample of 100 preschoolers (3, 4, 5-year-olds) in the pre- and post-test phase were administered a language comprehension test, a mental-state language comprehension task, and a test of emotion comprehension. Again, the children in the training group took part in conversational language games designed to stimulate the use of selected emotional terms from the story book. The training had a significant effect on children's performance in the comprehension of mental-state language and the comprehension of emotion, especially at 3 years of age.

Our latest study was aimed at expanding on our previous findings with 3 and 4 year old children (see Ornaghi, Brockmeier & Grazzani, 2011), by including a sample of 5-year-olds, and by using a variety of mental-state talk terms, in contrast with our previous study with 3 to 5 years old trained in emotional only lexicon (see Grazzani & Ornaghi, 2011).

We examined whether, compared with a control group, the children in the training group showed gains in their understanding of mental-state language and their performance on theory-of-mind and emotion understanding tasks; we also analysed the results as a function of age and gender. On the basis of our previous findings, we predicted that the training group would outperform the control group.

## **2. The Research**

In the new study, the participants were 102 preschoolers (mean age at pre-test was 52 months;  $SD = 9.9$ ) attending two kindergartens located in the city and province of Milan. They belonged to three age groups: three, four and five years. All participants came from middle-class socioeconomic backgrounds, were native Italian speakers, and their linguistic and cognitive development fell within the standards for their age group. They were evenly divided by

gender and randomly assigned to a *training group* and a *control group*. There were no differences between the two groups on any of the pre-test measures administered before the training.

This study too consisted of three phases: pre-test, training, and post-test. The pre- and post-tests, which were individually administered in counterbalanced order before and after the intervention phase, respectively, consisted of a test evaluating language comprehension (TVL; Cianchetti & Sannio Fancello, 1997), a false-belief understanding battery (composed of the traditional 'false-belief change of location task', 'false-belief unexpected content task' and 'false-belief explanation task'), a mental-state language comprehension task (MVT; Pelletier and Astington, 1998, in the Italian standardized version by Iannello & Antonietti, 2006) and a test of emotion comprehension (TEC; Pons & Harris, 2000). The administration of these instruments allowed us to verify that the control and experimental groups were homogeneous before the training intervention took place.

*Training phase: the intervention procedure.* Between the pre- and post-tests, a 2-month *intervention* took place. Children assigned to the training condition, in groups of about 4-6 at a time, took part in twice-weekly intervention sessions. Composition of the working groups was on the basis of teacher nomination; all groups were mixed-gender and made up of children of the same age. During these sessions they listened to stories enriched with psychological terms. The stories were presented in an illustrated story book entitled "*The adventures of Jack and Theo*" (Ornaghi & Grazzani, 2009), specifically created for the study. The book contained sixteen stories (a sample story is provided in the Appendix) structured according to the story schemas of Stein & Glenn (1979). The age-tuned intelligibility and appeal of the stories were pilot tested with some preschool children who did not take part in the study. The sixteen stories featured the adventures of two protagonists called Jack and Theo, a dolphin and a shark that encounter problems and come up with solutions.

In particular, eight mental state terms were selected as targets for the training: *getting scared*, *getting angry*, *wanting*, *remembering*, *knowing*, *thinking*, *believing*, and *deciding*. The texts were extensively enriched with related mental state language. For instance, in the case of *anger*, the stories were enriched with a range of anger semantic terms and expressions such as 'he was angry', 'he flew into a rage', 'disappointed and angry'; in the case of *fear*, the enriched emotional lexicon included 'scared', 'it's terrifying', 'very scared', 'he was afraid', 'he got a terrible fright' and so on; in the case of *wanting*, the stories contained numerous instances of terms such as desiring, looking forward to having, and similar. The same technique of semantic enrichment was adopted for the other terms. Each target word was presented twice, in two different stories read at two different training sessions.

During each conversational language game session (lasting about 10-15 minutes) the researcher stimulated all the children to use the target word as much as possible by means of focused questions or comments; all the participants were involved in thinking about and using the target mental-state terms. Following a standard procedure, the adult repeated a sentence from the story which had just been read and invited the children to take part in language games such as that reported in the following extract, from a session with a group of 4 year old children:

(1) *Adult*: In the story I just read to you, Diego exclaims "Of course! I remember putting my scarf down on the bench near the slide" ... He used the word "remember" ... so today we are going to play at using the word "remember". What does the word "remember" make you think of?

*Jacopo*: It makes me think that I remember when I put down a toy and later when my Mom calls me I go and pick it up.

*Adult*: Because you remember where you left it?

*Jacopo*: Yes

*Ivan*: And I remember that I was at the babysitter's, I was at the babysitter's because I was sick.

*Maria*: What's your babysitter's name? I can't remember...

*Ivan*: Giò. I was at Giò's and there was a fox on a motorbike and I asked Franco if I could have it. He said no, but they have a big bag of toys and so they gave me some other toys to bring home. Then one day, I went away, I can't remember... I took two toys with me and then I couldn't remember where I had put them but then in the end I found them.

*Adult*: Would anybody else like to say something with the word "remember"?

*Marco*: I remember that when I went to Andrea's – he's a friend of my Mom and Dad's – I was asleep in the car and I heard a noise behind the car; I thought it was my cousin Benedetta, but it wasn't... and I was scared; I opened the door of the car and my Mom came to take me out.

As may be observed from this example, the trainer focused both on continuously inviting the children to use the target term (*'would anybody else like to say something with the word "remember"?'*) and on encouraging them to reflect on the meaning of the term (*'because you remember where you left it?'*).

In contrast, after listening to the same story, the children in the *control groups* were allowed to engage in free play and were provided with toys such as jigsaw puzzles and construction games, deliberately selected to minimize conversation amongst them and especially to discourage potential discussion of the content of the stories. In the following images (Figure 1), experimental (left) and control (right) setting of the research during the intervention phase are showed.



**Figure 1. Experimental and control settings**

### ***3. The Impact of Language Games in Children's Mindreading***

Descriptive statistics for all variables by group condition at both time points are presented in Table 1.

	TRAINING GROUP		CONTROL GROUP	
	<i>Pre-test</i>	<i>Post-test</i>	<i>Pre-test</i>	<i>Post-test</i>
Age in months	52.55 (9.16)	57.59 (10.40)	51.43 (10.72)	57.33 (10.78)
Language comprehension	8.39 (1.97)	9.33 (1.23)	8.65 (1.34)	8.70 (1.93)
False-belief understanding	2.14 (1.84)	4.72 (1.62)	2.50 (1.12)	3.66 (1.12)
Mental-state language comprehension	7.39 (1.68)	9.83 (1.25)	7.76 (1.03)	7.88 (1.49)
Emotion comprehension	3.22 (1.89)	4.78 (1.83)	3.29 (2.02)	4.12 (1.72)

**Table 1. Means and standard deviations of all variables by group condition (Standard deviations in parentheses)**

The data were analyzed using a multivariate design. The factors Time (pre-post), Group condition (experimental-control), Age (3, 4 and 5 years old) and Gender (boys-girls) were the independent variables. Specifically, Time was a *within-subject* variable, while Group condition, Age and Gender were *between-subjects* factors. Scores for language comprehension, false-belief understanding, mental-state language comprehension and emotion understanding were the dependent variables. The multivariate analysis of variance revealed a significant effect of Time ( $F_{4,98} = 20.75$ ;  $p < .001$ ), and the

following significant interactions: Time  $\times$  Group interaction ( $F_{4,98} = 5.08$ ;  $p = .001$ ) and Time  $\times$  Age  $\times$  Group interaction ( $F_{4,98} = 1.98$ ;  $p = .05$ ). As there were no significant effects of gender, this variable was excluded from the subsequent analyses.

On the basis of this preliminary analysis, we conducted an ANOVA for each dependent variable.

For *language comprehension*, as measured by the TVL, we found a significant effect of Time ( $F_{1,96} = 10.83$ ;  $p = .001$ ) and a significant Time  $\times$  Group interaction ( $F_{1,96} = 3.84$ ;  $p = .05$ ). In fact, trained children obtained higher scores at the post-test than participants in the control group.

For *mental-state language comprehension*, as measured by the MVT, there was a significant effect of Time ( $F_{1,95} = 18.26$ ;  $p < .001$ ), a significant Time  $\times$  Group interaction ( $F_{1,95} = 14.15$ ;  $p < .001$ ) and a significant Time  $\times$  Age  $\times$  Group interaction ( $F_{1,95} = 3.07$ ;  $p = .05$ ). Post-hoc comparisons revealed that in the training condition 4 and 5 year-old children improved significantly more than 3-year-olds (Tukey,  $p < .01$ ).

With regard to *emotion comprehension*, a significant effect of Time ( $F_{1,93} = 31$ ;  $p < .001$ ) and a significant Time  $\times$  Group interaction ( $F_{1,93} = 5.83$ ;  $p = .01$ ) emerged, given that the training group obtained higher total scores in the TEC than the control group. Furthermore, the effect of the intervention was found to be more significant at 3 and 4 years of age ( $F_{1,93} = 3.85$ ;  $p = .02$ ).

Finally, regarding *theory-of-mind*, the training only had a significant effect on 4-year-old children's performance on the false-belief battery ( $F_{1,96} = 7.3$ ;  $p = .01$ ).

#### **4. Discussion and Conclusions**

The study just described had the general aim of testing a linguistic training procedure with a large sample of 3, 4, and 5 year old children. As in our previous studies, children actively participated in conversations based on language games with psychological lexicon, and independently of gender, they benefited from the opportunity to use this kind of lexicon in the context of social interaction. This is borne out by the fact that all the children who received training showed significant gains in language comprehension.

The training was particularly effective in enhancing emotion comprehension at the age of 3 years, in promoting all the types of understanding under study (i.e., theory- of-mind, emotion comprehension and mental-state language) at

4 years, and in enhancing the comprehension of mental-state lexicon at 5 years.

The results confirm 4 years as the crucial age – in the preschool period – at which to carry out conversational interventions based on the use of mental lexicon with the aim of enhancing children's linguistic and cognitive development. It is at 4 years of age that children gain greater awareness of the perspectives of others, becoming more adept at comparing them to their own perspectives as well as to objective reality. At this age, children also acquire the ability to pass false belief tasks and emotion comprehension tasks relating to the role of desires and beliefs in causing emotion.

Even the youngest children took part in the conversational exchanges with enthusiasm and interest, although their test scores did not improve significantly to the same extent as those of the 4 year olds. Nonetheless, they displayed significant gains in the test of emotion comprehension, which is particularly well suited to capturing the progress of the younger age group. The false belief battery did not seem to be as sensitive in picking up on training-induced gains in the ability to attribute false belief, an ability that children typically acquire at around age 4.

The older children displayed significant gains in the comprehension of mental lexicon, but did not display major improvement in theory-of-mind and emotion comprehension abilities, possibly on account of a ceiling effect of the administered tests, which are easy for children between 5 and 6 years of age (Grazzani-Gavazzi, Ornaghi, & Piralli, 2011).

Taken all round, the results of this study confirm the findings of past research reported in the literature and based on the conversational hypothesis. On the one hand, conversation about inner states facilitates the acquisition of the lexicon necessary for labeling mental states, and enables children to represent and reflect on abstract mental-state concepts (Bartsch & Wellman, 1995). On the other hand, it provides contexts in which children are confronted with the differences between others' and their own states of mind, thereby enabling them to develop early social understanding (Nelson, 2005; Harris, de Rosnay & Pons, 2005).

In conclusion, numerous studies have focused on the family context and maternal language, underlining their crucial role in fostering ToM and social cognition (Ziv, Smadja, & Aram, 2013). Nevertheless, our findings provide evidence for the usefulness of language-based intervention in educational contexts too. Kindergartens and schools are contexts in which educators and teachers can intensify both their use of mental-state talk in daily conversations with children and the reading of stories enriched with mental-state language (Ornaghi & Grazzani, 2013), actively involving children in conversation about inner states and consequently increasing their mind-

reading and social cognition abilities.

## ***Notes***

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## **APPENDIX**

Sample story: Diego's scarf

Term target: *To Remember*

[from: Ornaghi & Grazzani, 2009]

One day, Theo Shark and Jack Dolphin arranged to meet their friends Mary Starfish, Diego Sea Horse and Penny Jellyfish at the playground after school. When they got to the playground, Diego proudly showed them his new scarf. He told them that his Dad had given it to him when they had gone to the stadium together to see Diego's favorite football team. Theo Shark thought: "That's a really nice scarf; I wish I had one like that".

The five friends began to play: first they played ball, then hide-and-seek and then they decided to have a swimming race. Diego Sea Horse, who was still wearing his scarf, felt very hot. He decided to take off his scarf and put it down on a nearby bench. The friends continued to play and have fun until it was time to go home for dinner. When they said goodbye to one another and left the playground, Diego was so tired that he didn't *remember* to pick up his scarf.

When he got home, his Mom said: "Hi! Did you have fun at the playground?" Diego, who had really enjoyed the afternoon with his friends, replied: "Yes, I had a wonderful time." Then his Mom asked: "Did you show your new scarf to your friends?" At that very moment, Diego *remembered* with a shock that he had left his scarf at the playground. Feeling worried and upset, he said: "Oh, no! I left it at the playground. Now what will I do? What if it's lost forever?" His Mom told him not to be upset, saying that everybody forgets things sometimes. "Let's go back to the playground together to look for your scarf. Don't worry; I'm sure we'll find it. The most important thing is to *remember* where you left it" she said. Diego cried "Of course! I *remember* putting it down on the bench near the slide. I hope it's still there". And so, Diego and his Mom swam quickly to the playground. When they got there, Diego rushed over to the bench where he had left his scarf.

To his great surprise, there was no sign of his beautiful new scarf. Diego was very sad and upset and his Mom asked him: "Are you sure you left it right here" "Yes!" said Diego. "I *remember* very well that I put it down on the bench because I didn't want it to get dirty".

Then Diego's Mom had a good idea. She said: "Why don't we call by your friends' houses? Maybe one of them has seen your scarf". "You're right, Mom. Let's try that", replied Diego hopefully. Diego and his Mom decided to go to Theo Shark's house first. When they got to Theo's house, before Diego had a

chance to explain why they had come, his friend Theo said: "Hey, Diego! You know you forgot your scarf at the playground? When I realized that you had left it on the park bench, you had already gone home, so I picked it up thinking that I would give it back to you at school tomorrow". Diego, relieved and happy, thanked his friend Theo, took his scarf and went home with his Mom.