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## PSYCHOLOGICAL LANGUAGE RECURSIVENESS IN CHILDREN'S NARRATIVES\*

Words that denote emotions, perceptions and beliefs appear early in children's speech. With the acquisition of verbal language the child is able not only to feel and to respond to emotions but also to reflect and to speak about them. A critical step in the child's knowledge of the mind seems to be the children's ability to make explicit and contextualized the content of their psychological reasoning. 77 children, divided into two age groups (3.5 and 4.6 years on average) were observed in a narrative task. Our results indicated significant age changes in the psychological lexicon complexity. We did not find any difference in types and tokens of internal state words, but internal mental state attributions became more recursive from three to four years of age.

### Introduction

A theory of mind is a conceptual system whose value consists in the explanation and prediction of the activity of agents. Language must play a significant role in this kind of knowledge: in fact, it is primarily through language that we know the content of others' minds and we explain people's actions.

The principal feature of any theory of mind is that its elements have a relational structure because psychological states are always held by an agent and are typically directed at some object or situation (Moore, 1996). So it is more accurate to say that the theory of mind system codes psychological 'relations' between agents and objects or representational contents, and not only that it involves simple references to psychological states.

"Beliefs and desires are hybrid constructs spanning mind and world in a particular way by describing an internal mental state about, for or towards the world: talking about mental states describes both an internal mental attitude and some content of that attitude" (Bartsch & Wellman, 1995, p. 31). The content of this attitude can be linguistically expressed by an object complement, an infinitive verb or a subordinate proposition.

The development of a theory of mind, according to Feldman (1987), could be described as the construction of mental objects that can be thought about. The essential tool of

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this kind of construction is language. The seminal studies of Bretherton and Beegley (1982) have shown that between 2 and 3 years of age the child acquires a great variety of words for marking mental attitudes towards events. Given the lexicon to express mental attitudes, the next step in psychological reasoning is the acquisition of a procedure for reflecting on one's prior processes, such as a general mechanism of recursion.

Karmiloff-Smith (1992) argued that the cognitive system operates by re-representing its internal representations: reflexive and explicit knowledge emerges gradually from a practical, implicit knowledge and, if language is not strictly necessary to the first operations of understanding mind, such as pretend play, it becomes central to the more advanced process because it provides particularly effective scaffolding for the development of an intentional psychology, that is, the attribution and linguistic re-description of internal states referring to specific situations. "If I have a fear it must be a fear of something, or that something will occur" (Searle, 1983, p. 1). Language, too, is highly intentional, in a philosophical sense, because much of our discourse is directed to and is about states of affairs in the world (Freeman, 1994).

Psychological reasoning is recursive in nature because it consists in propositions that can be nested one within another: first order attributions of internal states create direct relationships between subject and world, such as "Peter is afraid of the dog", while second order attributions of internal states express a mental attitude towards subject/world relationships established by another internal state, such as "Sara thinks Peter is afraid of the dog". "This nesting can be repeated ad infinitum in principle, although in practice we can mentally cope with only a few nestings" (Whiten and Perner, 1991, p. 14). In a study concerning the acquisition of complementation, a special construction in which one proposition serves as an argument within another proposition, Bloom et al. (1989) observed that the first complement-taking verbs are verbs that name psychological relations rather than action, such as volition, cognition and communication verbs.

Another significant peculiarity of psychological thinking is their explanatory function: in other words, internal state attributions not only create relationships between people and the world but also let people explain and predict reality by means of unobservable, psychological notions.

A language very close to psychological reasoning is narration. Bruner and Feldman (1993) suggest that children's social experience is coded directly in a narrative form. These authors refer to this particular process as narrativisation of social interaction: telling her own experience as a story, the child constructs personal versions of reality and can actively use these stories to affect the partner's behaviors. For this reason, telling a story appears to be a very appropriate window to study psychological reasoning.

## Aim

The aim of this study was to describe the different forms of 3- and 4-year-old children's mental state attributions in a narrative by analyzing the complexity of the psychological lexicon defined as the ability to express articulate relationships between subject and world through recursive use of the structure *predicate / argument*.

We did not expect any quantitative differences in children's psychological lexicons. We did expect, however, that mental state attributions would become more recursive from 3 to 4 years of age.

We intended also to verify if, between three and four years of age, the more frequent forms of embedded propositions are those that include attribution to internal mental states rather than action (Bloom et al., 1989).

### Subjects and method

A total of 77 children, divided in two groups according to age, were observed while "reading" the picture book "Frog where are you?" (by Mercer Meyer, 1969). There were 39 children at age three (mean 3.5, range 3.1-3.7), and 38 children at age four (mean 4.6, range 4-4.10).

### Coding

The stories were audio-videorecorded, transcribed and coded by two independent observers. Each story was analyzed in terms of "clause" (a predicative expression with its arguments, Berman & Slobin, 1994) and ISW (Internal State Words).

According to Bretherton & Beegley, 1982 and Bloom et al., 1989, six ISW types were coded: perception/physiology, cognition, obligation, emotion/affect, volition/intention, communication. The clause coding agreement between the coders was 91% and the ISW coding agreement between the coders was 87%.

Each psychological attribution in the stories was also coded at one of four complexity levels:

ISW level A is defined as a predicate and one argument; the narrator produces a comment on the character's internal state ("he's afraid", "he thinks"): in this case, the attribution establishes only a relationship between the narrator (who produces the attribution) and the character (who experiences the internal state).

ISW level B is defined as a predicate and two or more arguments ("he is afraid of the owl"): through his attributions the narrator establishes a relationship with the character and his world.

ISW level C is defined as a first-order recursion: as on level B, the narrator establishes a relationship with the character and his world, but this relationship is expressed by two predicates ("the child wants to find the frog"): the relationship *character/world* is different from the previous two levels because one predicate (modal, aspectual, causal verbs) defines the modality of the action expressed by the nested predicate.

ISW level D is defined as a second-order recursion of two structures of predicate and argument related to each other ("he was afraid that it would fall, he thinks that the frog has escaped"): the second structure can represent the argument of the first structure or the two structures can be connected by a subordinate connective (causal, temporal, relative, conditional). In any case, the relationship *character/world* is more complex because two different actions are connected with different functions in the narration.

The ISW level coding agreement between the coders was 85%.

We coded not only the subordinate propositions introduced by an internal/mental state reference (ISW level D) but all the subordinate propositions (relatives, causals, finals, conditionals, etc.) produced by the children in their narratives. In this case, the coding agreement between the coders was 90%.

We checked also that all the types of internal state words at three and at four years of age could be present on each level of complexity to ensure that the frequency of levels was not affected by the frequency of types; we adopted a productivity criterion (Bloom et al.,

1989) defined as the occurrence of at least 10% of each level of complexity by each type of internal state word.

## Results

In our sample a total of 3808 clauses and 968 Internal State Words were produced by the children.

To verify the age effects we made a separate analysis of variance (ANOVA) with age as between-subject variable, and story length, ISW/clause ratio and the four complexity levels of ISW as within-subject variables.

The length of the stories, measured in clauses, grows from age three (mean = 42.8) to age four (mean = 46.6) but the difference between mean number of clauses in the two age groups does not reach statistical significance.

Also, the psychological lexicon used by the children in their stories seems not to undergo any quantitative development with age: the mean ISW/clause ratio is about the same: .22 at 3 years, .27 at 4 years. The comparison does not reach the level of significance. We did not find any significant differences between ages in the frequency of the six types of ISW. The most frequent internal-state words were references to perceptual/physiological states (42%), followed by expression of communication (21%), emotions (17%), volition (13%), cognitions (5%) and obligations (2%).

The complexity levels of the psychological lexicon present different patterns of change with age; to explore this change we performed an analysis of variance (ANOVA) with age as between-subject variable and the four levels of ISW as within-subject variable.

The first result is that the ISW levels differ significantly ( $F_{1,3} = 18.192$ ,  $p = .000$ ) (the mean frequencies of the different ISW levels are the following: level A 2.6, level B 3.3, level C 4.5, level D 1.8). We can interpret these data as support for our coding system; in fact, it seems to us that taking account of linguistic structure complexity, we can discriminate a significant developmental aspect of psychological reasoning.

The interaction between age and ISW levels does not reach significance, but in analyzing simple effects, an interesting pattern of results emerges.

At level A (the ISW content is not expressed) we do not have any significant change and the mean frequencies of ISW level A are almost the same in the two groups (2.4 at 3 years, 2.8 at 4 years).

Level B (a predicate with an argument) increases significantly with age. The mean frequency of ISW level B is 2.6 at 3 years and 4.0 at 4 years ( $F_{1,76} = 6.177$ ,  $p < .015$ ).

Also, level C (first-order recursiveness) increases with age and we found a trend to significance. The mean frequency of ISW level C is 3.8 at 3 years and 5.1 at 4 years ( $F_{1,76} = 3.506$ ,  $p < .065$ ).

The ISW level D (second-order recursiveness) increases significantly from 3 to 4 years of age. The mean frequencies of level D ISW are 1.3 and 2.3 respectively ( $F_{1,76} = 4.456$ ,  $p < .038$ ).

As concerns this more advanced level, it is interesting to note that, in the Internal State Words of level D produced by younger children, the most frequent main clause predicates are perceptual or communicative verbs:

*Diego (3.4 years): "(the child) sees that she is not here" (vede che non c'è)  
 "(the child) says that this is no more here" (dice che non c'è più).*

Instead, children aged four use different kinds of predicates in the main clauses, such as cognitive verbs or the explication of a false belief.

*Marika (4.6) "He believed that it was a tree's thing" (si credeva che era un coso degli alberi).*

*Giorgio (4.7) "He could be that there were also the ghosts" (può darsi che c'erano anche i fantasmi).*

Moreover, in the older children's language, we found several predicate/argument structures expressing internal/mental states linked by causal connectives with other propositional structures. It would seem that a specific characteristic of psychological reasoning at four years of age is the causal interpretation of reality.

*Andrea (4.6): "the child takes him on the hand: he is bad because he get worried with him because he broke this thing here" (il bambino lo prende sulle mani, è cattivo perchè si inquieta con lui perchè ha rotto questo coso qui).*

*Nicolò (4.7): "the child pushed him because he is bad and the child fell down and the dog escaped" (il gufo l'ha spinto perchè è cattivo e il bambino è caduto e il cane è scappato).*

Finally, we verified if psychological language could provide an effective frame to produce more complex sentences, such as subordinate propositions in which one proposition serves as an argument within another proposition. We found 121 subordinate propositions in the stories told by three-year-old children and 235 subordinate propositions in the stories told by four-year-old children. 58% of propositions at age three and 55% at age four are introduced by a mental state predicate: this result becomes more evident if we consider as well subordinate propositions that include an internal state reference. In this case, we have 77% of propositions inclusive or connected to an internal state reference at three years of age and 85% at four years of age.

This result shows that, not only between two and three years of age, as shown in the Bloom et al. study (1989), but also later, psychological reasoning interacts with and supports complexity of language.

## Conclusion

As to the first goal of our research, our results indicate that, from 3 to 4 years of age, children's ability to make reference to other people's mental states changes qualitatively with age; we found no lexical development, because the amount of internal state words present in the children's narratives and the distribution of ISW types are almost the same at the two ages. On the contrary, the internal/mental state attributions become more recursive with age. It seems to us that this result confirms Moore's statement; the heart of the theory of mind is the expression of relations between agents and objects in the world and the ways to express explicitly such relationships change with age.

The knowledge of mental states requires not only a conceptual development but also the mastery of a complex linguistic construction. In other words, children must be able to hold in mind two propositions, where one is expressible in a simple sentence frame

and the other is the mental attitude directed toward the contents of that proposition (Bloom et al, 1989).

This ability, which emerges when children talk about their own mental states, increases with age, and seems to be a specific and criterial index of development and change in the domain of psychological reasoning.

In conclusion, after Freeman (1994), it seems to us that advance in psychological understanding consists in a new use of existing resources rather than in a conceptual revolution. In other words, "we may regard the four-year-old advance as an amplification of the three-year-old advance, a dramatic amplification with far-reaching consequences, but not a single discontinuity whereby a concept of representation that was previously unavailable in the child's conceptual system suddenly comes on stream" (Freeman, 1994, p. 99).

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