Chapter 2

THE MENTAL VERBS IN DIFFERENT CONCEPTUAL DOMAINS AND IN DIFFERENT CULTURES

David R. Olson,[1] Alessandro Antonietti,[2] Olga Liverta-Sempio,[3] Antonella Marchetti.[3]
[1]HDAP, Ontario Institute for Studies in Education (OISE), University of Toronto; [2]Department of Psychology, Catholic University of the Sacred Heart, Milan. [3]The Theory of Mind Research Unit, Department of Psychology, Catholic University of the Sacred Heart, Milan.

2.1 CULTURE, LITERACY, SCHOOL AND METAREPRESENTATION

This chapter focuses on relationships between the development of mental language comprehension and culture. In a wide sense, culture refers to the general system of values, beliefs, practices, as well as institutions, shared within a country. All these aspects of culture reach individuals through the semiotic mediation constituted by language. Such a mediating role of language acts both by means of the common syntactic, semantic and pragmatic grounds of language itself and by means of the specific communicative sub-systems developed by the different contexts of experience. Among a variety of educational agencies, in most countries it is specially and formally the school which has the task of introducing pupils into the mastery of the general linguistic competence as well as into the mastery of the domain-specific linguistic abilities.

In school settings the acquisition of both general and domain-specific linguistic capacities requires children to reflect about language itself, so prompting and enhancing metalinguistic competence. Such a kind of

competence includes the awareness of the mental activity involved in language. This suggests a close relationship between metalinguistic and metacognitive skills. To give an example, metalinguistic competence allows children to separate the propositional content of an expression (what is said) from its illocutionary force (depending on the mental state of the speaker), so helping to consider statements independently on the agreement or the disagreement with the speaker. This separation, or lack of separation, can also affect adulthood. As Olson & Astington (1993) pointed out, the results of Luria's (1976) investigations about illiterate adults' reasoning showed that these persons focused onto the statements of the syllogisms that they were asked to solve, by considering them merely as expressions of the interviewer's beliefs (illocutionary) instead of considering their propositional content. Furthermore, to discover the tacit inferences implied in talk and in written texts people must often identify the mental states underlying words. Finally, the language of schooling is also the language of epistemology: it allows us to talk about beliefs and reasons for believing (Astington, Pelletier & Homer, 2002; Burr & Hofer, 2002; Olson, 2003).

Literacy, starting from the already existing abilities, promotes the mastery of metalinguistic and metacognitive competencies needed to understand other's mind expressed by formal texts by which disciplines transmit different kinds of knowledge (Olson & Astington, 1993; Olson & Homer, 1996; Olson & Torrance, 1996; Groppo, Antonietti, Liverta-Sempio & Marchetti, 1999). School should favour (at least in the higher degrees of instruction) the capacity to connect the contents of the disciplines taught with the aims and intentions of those who first worked them out. This should have a double effect. First, it could avoid the pupil to build up a misleading concept of knowledge, viewed as uniquely objective, not dependent on the perspectives and motives of its proposes. Second, it would help to understand the ways by which knowledge is acquired, thus favouring the identification of the tools necessary to construct knowledge itself.

Olson & Astington (1993) stressed how mental verbs are central to the process of education and the role that schooling may play in their acquisition (Astington, 1998). Literacy, they argued, enhances metalinguistic and metacognitive skills through the discussion in school of what texts say, mean, claim, prove, and so forth, namely, some concepts central to disciplined knowledge. The Vygotskyan derivation of the approach (see also Astington, 1996) appears in the idea that literacy is not simply built on the acquired level of cognitive development but contributes to re-structure cognition itself (Olson, 1996). In fact, literacy activities lead one to listen to and to think about language in a new way. They do not only promote the capacity to "write" the speech; they provide children with a scriptic model to be used in thinking about language. The script-as-model (Olson, 1994; Olson & Homer, 1996; Homer & Olson, 1999) predicts that in learning the script of their culture, children are also acquiring a model to think about language.

Consequently, Olson & Astington (1993) claimed that teachers should talk more about what they themselves think, know, expect, remember, wonder about, guess, assume, infer, conclude and so on, and need to encourage students to do the same. By consciously introducing and using such language about thinking in the classroom, teachers will lead students to reflect on and articulate their thinking and its expression. Texts are not to be learned: they are to be interpreted. And interpretation is, in part, a matter of assigning the appropriate attitude or force to the utterance. Learning is deciding how a statement is to be taken.

In this perspective, metalinguistic and metacognitive terms provide both language for thinking and language about thinking, allowing the speaker to communicate his/her stance towards a proposition. One of the ways in which preschoolers' development of a theory of mind first becomes evident is in their use of simple metacognitive and metalinguistic vocabulary (Bretherton & Beeghly, 1982; Shatz et al., 1983). While children are acquiring this vocabulary, they are coming to understand more about minds and thoughts (Astington & Gopnik, 1991).

Research on children's understanding of mental verbs has grown in importance during the last fifteen years, dealing mainly with the following topics: the chronology of acquisition of such terms (Misciones et al., 1978; Wellman & Johnson, 1979; Breterthon & Beeghly, 1982; Shatz et al., 1983; Shatz, 1994; Astington & Olson, 1990; Wellman & Bartsch, 1994; Bartsch & Wellman, 1995; Camaioni & Longobardi, 1997); the psychological use of mental lexicon (Breterthon & Beeghly, 1982; Shatz et al., 1983; Olson & Torrance, 1987; Shatz, 1994; Siegal & Peterson, 1995; Olson, 1997; Camaioni, Longogardi & Bellagamba, 1998; Zanobini, Scopesi & Cattani, 1998); the referents of mental lexicon (Breterthon & Beeghly, 1982; Shatz et al., 1983); the relationship between mother’s use and child’s development of mental state language (Furrow, Moore, Davidge & Chiasson, 1992; Jenkins et al. 2003); the understanding of the polysemic nature of cognitive verbs as “to know” (Booth & Hall, 1995).

As regards this last topic, a hierarchical six-levels model has been proposed, which organizes the meaning of cognitive verbs from the less to the most abstract and difficult from a conceptual point of view (respectively, “to know” as act of perception and “to know” as belief or attitude towards the truth of a statement) (Booth & Hall, 1995).

Finally, the topic which has elicited and continues to elicit the biggest amount of studies is the relationship between theory of mind development and the use of mental language.

From this perspective, the object of investigation is mothers’ or children’s mental language in daily interaction within the family and children’s theory of mind development (see Dunn, Bretheton & Munn, 1987; Dunn et al, 1991; Dunn, 1994; Antonietti, Liverta-Sempio, Marchetti &

Astington in this volume). It is worth noticing that in these studies the mental language is examined in everyday life, while cognitive and in general epistemic mental verbs are especially used in the formal contexts of disciplines, where they can assume particular meanings deriving from the specific discipline considered. Or example, “to think” can be use in mathematics to mean “to evaluate” (e.g. “What do you “think” is the result of 31x5?” “I think - that is “I evaluate” - it is about 150”) and in natural sciences to mean “to predict” (e.g., “What do you “think” will happen if a glass falls down?”. “I think” – that is “I predict” - it will be broken”). The polysemic nature of mental verbs depends also on the context of use or discursive practice within which the verb is mentioned.

Following these considerations it seems important to determine if metalinguistic/metacognitive competencies we are dealing with represent a general acquisition, crossing the specific domains of knowledge, or if their developmental patterns vary depending on the particular domain they are applied to. Metalinguistic/metacognitive awareness might be a system consisting in a series of separately acquired subsystems which can be responsible for the observed décalages. That is, performance may depend on the specific kind of metalinguistic/metacognitive ability under investigation and on the more or less explicit understanding required by the task. Furthermore, since culture gives children the model to be used to think about language, there will be relevant cross-cultural differences as far as metalinguistic/metacognitive awareness is concerned.

The present chapter moves from these general considerations to investigate the relationships between the cultural activity of literacy and the development of the language to think and talk about the mind. An important assumption of this work is that metalinguistic/metacognitive abilities are adequately represented by children's understanding of metalinguistic and metacognitive verbs. The first purpose of this research is to investigate the development of these abilities as a function of cultural and literacy demands of different school levels.

Secondly, do these metarepresentational competencies represent a general acquisition, crossing the specific domains of knowledge, or do their developmental patterns vary depending on the particular domain they are applied to? The question is relevant since, as we have said, school represents the institutional context aimed at promoting the capacities here considered. For this reason, the second purpose of this research is to investigate the relation between appearance of metalinguistic and metacognitive abilities across domains of knowledge. Three different domains have been considered: folk psychology, history, and mathematics. Specifically, the first (folk psychology) represents a "control" domain because it is not an object of formalised teaching (at least in the general school curriculum), whereas the other two are taught beginning in Primary School. Considering Brunerian distinction between "narrative" and "paradigmatic" thought (Bruner, 1986),

we can say that mathematics relies on a more formal or paradigmatic way of thinking whereas history relies on a narrative way of thinking. This justifies the choice of these two disciplines.

Thirdly, are there cross-cultural differences in children's acquisition of metarepresentational concepts? Although the difficulties of developing tests which are comparable across cultures is well known, an attempt was made to compare children's knowledge of these concepts across different countries: Italy, Canada, Serbia, and Tanzania. Differences, if found, may reflect the curriculum of study or the structure of language itself.

Thus, to summarise, the following variables should be manipulated in the three studies here reported:
- school level;
- domain of knowledge (history vs. mathematics vs. folk psychology);
- cultural-linguistic context (Italy vs. Canada vs. Serbia vs. Tanzania).

2.2 A TEST TO ASSESS THE UNDERSTANDING OF METAREPRESENTATIONAL VERBS

The investigation is based on a series of trials whose goal is to assess the ability to understand metacognitive and metalinguistic verbs. These trials are grounded on a task devised by Astington & Olson (1990). Three different versions have been constructed; each version concerns a specific domain of knowledge (folk psychology, history, and mathematics). Trials are arranged as follows. For each target verb a short story is presented. In such story a general metacognitive or metalinguistic verb (to think or to say) occurs. Subject’s task is to select the correct response among four possible answers. The correct response corresponds to the specific metarepresentational verb (for instance, to hypothesise or to conclude) which can be used instead of the general verb. Students must substitute the general verb to think or to say with the appropriate metacognitive or metalinguistic verb.

An example of item is reported above:

Jim learned from his history teacher that Napoleon won battles because he was an experienced general. Jim is now reading the story of a battle where a small army led by an old experienced general was fighting against a large army led by a young general. Jim *thinks* that the battle would be won by the old general. However, when he goes on reading, he realises that the battle was won by the young general.

A. Jim predicts
B. Jim knows
C. Jim interprets
D. Jim implies

The complete sets of items are reported in the Appendix.

Appropriateness of the correct response was tested by asking 5 adults with a high level of education to find out a good, specific synonymous for the verb to say or to think within each story. In all cases they agreed selecting the more precise term corresponding to the target verb for that story. In each story, in addition to the correct target verb, three incorrect verbs served as distractors. Distractors were set up as follows: one incorrect answer was another (incorrect for that story) target verb randomly selected among the eight remaining target verbs so that each target verb occurred as incorrect answer the same number of times; the other two incorrect answers were two filler verbs selected randomly among a list of metarepresentational verbs used by Astington & Olson (1990) that differed from those which have been chosen as target (e.g., to understand, to believe, to demonstrate, to explain). The order of the correct and of the wrong answers was varied systematically in each story.

The nine considered verbs are, by following the Astington & Olson's (1990) distinction:

- *metacognitive verbs*: to assume, to doubt, to hypothesise, to infer, to remember;
- *metalinguistic verbs*: to admit, to conclude, to confirm, to predict.

These verbs were selected from the twelve utilised by Astington & Olson (1990); three verbs - namely, to assert, to interpret, and to imply - have been excluded because a direct counterpart was not available in Italian.

In the present study the original structure of the task has been changed to avoid some methodological flaws. More precisely, the order of presentation of the items and the order of the four possible responses in each item have been counterbalanced. Furthermore, in each item the three wrong responses are varied systematically so that their meaning is neither too close nor too far from the meaning of the correct response.

For each target verb three different versions of the story - each corresponding to one of the three specific domain of knowledge considered here (folk psychology, history, and mathematics) - have been provided. The task pertaining each domain was articulated in 9 different versions so that each story could be presented to participants in each of the 9 possible positions the same number of trials. We attempted to write stories of almost the same length and whose protagonist was a male in about half the number of times and a female in the other half. Furthermore, the verb to say or to think was always used at the present tense.

2.3 MENTAL VERBS IN DIFFERENT DOMAINS

The task was presented to two-hundred and seven Italian students, divided in the following school levels:

- Grade 3 (eight years of age) and 5 (ten years of age) of Primary School (respectively: 20 males plus 14 females and 20 males plus 24 females);
- Grade 2 (twelve years of age) of Junior High School (19 males plus 17 females);
- Grade 2 (fourteen years of age) of Senior High School (20 males plus 22 females);
- undergraduates attending different faculties (25 males plus 26 females, ranging in age from twenty to twenty-five years of age).

All students lived in a Lombardia, a region of northern Italy.

The first two subsamples (Grade 3 and 5) were constituted in order to study the development of metarepresentational competencies in children younger than ones considered in Astington & Olson's (1990) study, in which the youngest subsample was drawn from Grade 6 children; we can presume that in earlier ages children should have acquired adequate metarepresentational abilities and basic literacy skills needed to perform in the task. The first four subsamples were separated by 2 years of age in order to evaluate very precisely possible developmental changes. Undergraduates were included as the alleged endpoint in the development of the competence under investigation; their performances should be used to evaluate possible gaps observed in the preceding school levels.

Items presented to half primary school pupils were conjugated in the grammatically correct way (using the subjunctive mood of the verb where needed); items presented to the remaining primary school pupils were conjugated using the same verbal mood appearing in the story. We devised this procedure believing that younger subjects could be affected by the grammatical “surface” of the verb in choosing their answer among the four proposed verbs[1].

The researcher explained to students that an anonymous, non-evaluative task will be presented to them. Students were asked to give only one answer for each item. The task was individually administered without temporal limitations.

The whole set of trials was submitted to students over two days: the first day the task concerned one domain of knowledge; the following day the other two domains. The order of the presentation of three domains has been counterbalanced across participants.

---

[1] In Italian the form of the subjunctive mood of verbs is different from the form of the indicative mood.

Score “1” was assigned to each correct answer and score “0” to each wrong answer. For each participant a total score (minimum = 0; maximum = 9) was computed for each domain by counting the number of correct responses he or she answered in that domain. For instance, if a student identified the correct verb in three stories out of the nine provided, the score "3" was assigned to that student.

As far as the possible effects of verbal mood are concerned, we found that neither verbs’ conjugation nor interaction between this factor and school level have been shown to be significant.[2] We did not obtain significant gender effects except in three cases: *to admit* in folk psychology and in history and *to doubt* in mathematics: in all these cases females outperformed males. Analyses of total scores in each domain showed that in folk psychology and mathematics females were significant more correct than males.

Comparing students from humanistic faculties with students from scientific faculties, a significant difference emerges only in the case of the verb *to assume* in the domain of mathematics, where students from humanistic faculties were significantly more correct than students attending scientific courses. Furthermore, humanities students performed significantly better than scientific students also as regards total scores.

By considering the developmental trend, we notice that the acquisition of metarepresentational verbs is a complex process, lasting till advanced school grades. In fact, even undergraduates did not reach perfect performance (only the verb *to admit* in folk psychology domain obtained the maximum of correct answers). Undergraduates succeeded within wide ranges of variation (especially for metacognitive verbs), reaching higher levels of performance as far as metalinguistic verbs are concerned (Table 1). The developmental trend varies both within the same verb in different domains and between different verbs in the same domain. Post hoc analyses showed a variety of patterns of homogeneous subgroups of school levels. For instance, significant differences occurred between primary students (Grade 3 and 5) and the older ones (*to remember* in history); only Grade 3 primary children performed significantly worse than other participants (*to hypothesise* in history); undergraduates outperformed significantly all the other levels (*to predict* in mathematics); Primary School pupils (Grade 3 and 5) gave a significant lower number of correct responses than Junior School students who, in turn, gave a lower number of right responses than High School students and undergraduates (*to conclude* in folk psychology) (Table 1). The overall picture suggests that metalinguistic verbs are mastered before metacognitive verbs and that the former ones are in general easier to identify than the latter ones as proved by the overall mean of correct responses (0.62

[2] Detailed statistical analyses are reported in Antonietti, Liverta-Sempio & Marchetti (1998a; 1998b).

vs. 0.50) and by the ranges of the means which is from 0.49 to 0.77 in the first case and from 0.33 to 0.61 in the second case.

Table 1– Mean Numbers of Correct Answers under each School Level for each Verb in each Domain (First Study)

Verb	Primary School Grade 3	Primary School Grade 5	Junior High School Grade 2	Senior High School Grade 2	University
To admit					
psychology	0.61	0.87	0.81	0.94	1.00
history	0.71	0.66	0.72	0.93	0.86
mathematics	0.43	0.57	0.69	0.81	0.89
To assume					
psychology	0.32	0.49	0.61	0.61	0.62
history	0.68	0.70	0.81	0.69	0.67
mathematics	0.27	0.45	0.44	0.33	0.36
To conclude					
psychology	0.20	0.28	0.50	0.83	0.94
history	0.27	0.55	0.78	0.88	0.76
mathematics	0.11	0.32	0.39	0.72	0.91
To confirm					
psychology	0.61	0.57	0.81	0.89	0.96
History	0.47	0.57	0.61	0.76	0.65
mathematics	0.36	0.49	0.58	0.86	0.72
To doubt					
psychology	0.23	0.47	0.42	0.78	0.81
History	0.26	0.45	0.47	0.64	0.65
mathematics	0.16	0.51	0.58	0.64	0.81
To hypothesise					
psychology	0.14	0.30	0.47	0.44	0.62
History	0.18	0.45	0.57	0.69	0.69
mathematics	0.05	0.06	0.06	0.14	0.04
To infer					
psychology	0.07	0.36	0.36	0.69	0.53
History	0.29	0.39	0.50	0.69	0.86
mathematics	0.16	0.51	0.58	0.64	0.81
To predict					
psychology	0.25	0.64	0.64	0.75	0.79
History	0.36	0.52	0.67	0.64	0.61
mathematics	0.20	0.13	0.19	0.28	0.60

Tab. 1 cont.

Verb	Primary School Grade 3	Primary School Grade 5	Junior High School Grade 2	Senior High School Grade 2	University
To remember					
psychology	0.59	0.60	0.56	0.75	0.66
History	0.30	0.27	0.56	0.69	0.76
mathematics	0.57	0.72	0.67	0.72	0.72
Total					
psychology	3.02	4.57	5.17	6.69	6.91
History	3.51	4.57	5.81	6.62	6.39
mathematics	2.41	3.70	4.03	5.08	5.96

If we consider the total scores obtained in each domain (Table 1), we realise that in mathematics the highest number of significant increases among school levels emerged (Grade 3 of Primary School vs. Grade 5 Primary and Junior School vs. High School vs. University); at the opposite, only a significant increase occurred (from Primary School to the subsequent grades) in history. The three domains shared the presence of a significant change at the primary school level: from Grade 3 to 5 in folk psychology and mathematics; from Grade 5 and junior school in history.

As regards the three domains of knowledge, in some verbs the metarepresentational ability under investigation was modulated by the domain. For instance, as far as the verb *to hypothesise* was concerned, we noticed that the rates of correct identifications were markedly lower in mathematics (0.07) as compared to folk psychology (0.39) and history (0.53) and that such a trend was present at each school level. The same trend can be observed in the verb *to assume*, even though marked differences between mathematics and the other domains have recorded from junior school to university but not in primary school.

Some verbs are more difficult overall such as *to assume*, *to doubt*, and *to conclude*, but there is considerable variability across items and domains. The wide range of variation in the acquisition of the metarepresentational verbs shows that we dealing with “families” of verbs inherently heterogeneous. The meaning of these verbs appears to be strongly situated and depending on the specific context of occurrence. We suggest that it can depend on the higher “concreteness” of thinking about of speech acts compared with thinking about thinking: the former are more instantiated in social relationships and exchanges, whereas the latter, though originating from communication, ends in internalisation and abstraction.

Table 2 - Mean Numbers of Correct Answers to each Verb Ordered in Term of Difficulty According to the Total Scores (Second Study)

	Canada	Italy	Total
Metacognitive verbs			
to assume	.59	.57	.58
to remember	.43	.58	.52
to doubt	.35	.39	.37
to infer	.39	.36	.37
to hypothesize	.21	.28	.25
Metalinguistic verbs			
to confirm	.41	.55	.49
to admit	.22	.65	.47
to conclude	.28	.35	.38
to predict	.38	.38	.38

2.4 A CROSS-CULTURAL COMPARISON BETWEEN TWO WESTERN COUNTRIES

The first study suggested that the period between Primary and Junior School is critical in the development of mental verb comprehension. Thus, we were induced to deepen the analysis of such a period through by administering the same test to a new sample of children. A further aim of our second study was to acquire information about the response patterns to the test in different cultural contexts, by choosing an environment like Italy which is considered belonging to the Western culture, but in another continent.

Sixty Canadian and sixty Italian students volunteered for the study. In each country three school levels were chosen: Primary School Grade 3 (8 years of age), Primary School Grade 5 (10 years of age), and Junior High School Grade 7[3] (12 years of age). Twenty students were selected at each grade level in each country according to the following procedure. Two schools judged to be typical of their regions (respectively, the provinces of Ontario and Lombardia) were selected for each country. In each school, for each level, two classes, again judged as typical of the school, were picked. In each class 10 students were selected randomly among a group of volunteers.[4] Because of some omissions in the protocols, some participants have been

[3] In this cross-national study we adopt the labels of the North American school system: Junior High School Grade 7 corresponded to the Junior High School Grade 2 in the Italian school system where the number of grades begins again from 1 by passing from the Primary School to the Junior High School.

[4] We thank Dr. Vittoria Ardino for contacting the schools participating in the study, for test administering, and for collaboration in data analyses.

excluded; this accounts for the differences in the number of participants considered in each analysis.

The study was carried out within the school environment during the school day. The researcher explained to students that an anonymous, non-evaluative task would be presented to them. The materials and the procedure were the same as in the first study. The stories constituting the test were translated into English by applying the backward translation procedure (Hambleton, 1994; Sperber, Devellis & Boehlecke, 1994).

Table 2 shows the mean total scores recorded under each school level by each country.[5] As far as the folk psychology domain is concerned, significant effects due to the country and to school level emerged; the interaction between these two factors was not significant. At each school level Italian students performed better than Canadian ones. The ability to identify the correct target verb increased across school level in both countries: Primary School Grade 3 children obtained a mean total score significantly lower than the other grades, which were not significantly different each other. In the history domain school level significantly affected responses, whereas no significant differences between Canada and Italy occurred; the interaction between these two variables was not significant. In mathematics, Italian students obtained scores higher than Canadian participants in all school levels. The higher the school level, the higher was the metarepresentational ability; also in this case Primary School Grade 5 and Junior High School students outperformed Primary School Grade 3 students. The two factors did not interact. It is worth noticing that under each school level mean scores in the domain of folk psychology and history were higher than in mathematics.

On the whole, by looking at mean scores, we observed the following patterns:

1. A regular growth of metalinguistic and metacognitive abilities emerges with regards to school level. This result is applicable for both Canada and Italy. To a greater or a lesser degree Grade 3 students performed more poorly compared to Grade 5 and Junior High students as post hoc tests showed in all domains.

2. Folk psychology had the highest number of correct answers.

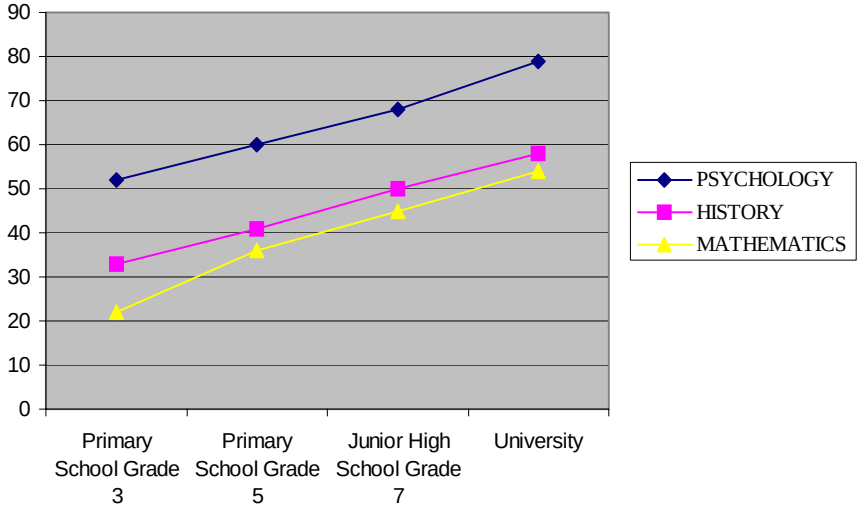
3. Italian students performed better than Canadian: total scores showed that in mathematics and folk psychology Italian students may have a more shaped metarepresentational knowledge than Canadian students at all school levels considered here.

Figure 1 reports proportions of correct answers for each verb by collapsing all students (across age level and country of origin. The most recognisable verbs were two metacognitive verbs (*to remember* and *to*

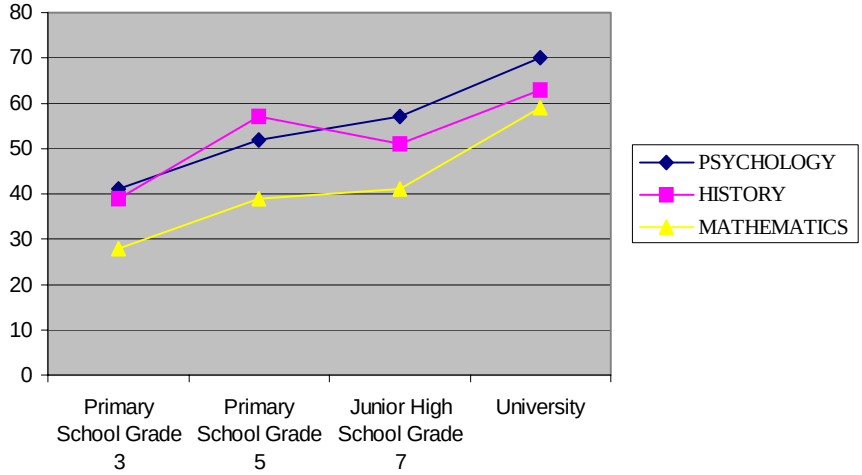
[5] Detailed statistical analyses are reported in Groppo, Antonietti, Ardino, Liverta-Sempio, Marchetti & Olson (2000).

assume). It is worth noticing that, whereas the first verb is quite used both in Canada and Italy, the second is seldom employed. Thus, it seems that the ability to recognise the proper meaning of metarepresentational verbs is relatively independent from the frequency with which such verbs occur in everyday language but it may be learned in school. Difficulty of a verb might also depend on the distinctiveness of the distractors. For instance, the verb *to remember* might be easy to identify because none of the other target verbs and none of the filler verbs has a meaning close to that of *to remember*; conversely, *to hypothesise* might be difficult to identify because it is partially overlapping with *to believe*. However, this claim can not be maintained with respect to verbs such as *to assume* - which is well-recognised even though it might be confused with *to hypothesise*, *to believe* or *to doubt* whose meaning can not be confused with other target and filler verbs.

Italy



Serbia



Tanzania

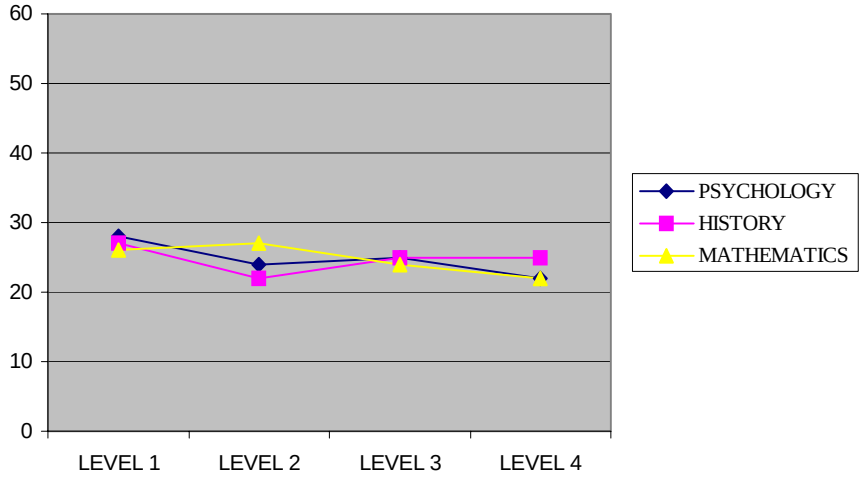


Figure 1 - Mean Total Scores in each Country under each School Level in each Domain (Third Study).

Table 3 gives a detailed report of proportions of correct responses for each verb in each domain under each school level both for Canadian and Italian students. This table allows one to figure out the effects on performance produced by the independent variables. For example we could focus attention on the verb *to remember*: on the whole, this verb was less recognised in folk psychology than in the other two domains; furthermore

Italians showed an improvement across school level while Canadian students showed a decreasing proportion of correct, perhaps because they preferred a more technical term.

In order to have an overview of the effects observed in the set of the 9 verbs here studied, we can underline the following issues. As regard to the developmental trend, we can notice that an increase of the proportion of correct answers across school level occurred in 10 out of 27 cases (these 27 cases resulted by multiplying the 9 verbs by the 3 domains) in the Canadian subsample and in 16 out of 27 cases the Italian subsample. Thus, it seems that Italian students increased their metarepresentational competencies across school levels to a larger extent than Canadian ones. Moreover, this kind of improvement appeared in 9 out of 18 cases (these 18 cases resulted by multiplying the 9 verbs by the 2 countries) in the folk psychology domain, in 10 out of 18 cases in history, and in 6 out of 18 cases in mathematics. This suggests that items were more discriminating in the Italian form than in English.

To consider the influence of the domains on the verbs, we collapsed responses given under the three school levels and in the two countries and found out that in 6 verbs (*to admit*, *to assume*, *to confirm*, *to doubt*, *to hypothesise* and *to predict*) rates of correct answers in mathematics were lower than in the other domains; students recognised the verb *to admit* and *to hypothesise* in history better than in the other domains; in folk psychology participants obtained rates higher than in the other domain with the verbs *to conclude*, *to doubt* and *to assume* and lower rates with the verb *to infer* and *to remember*. In conclusion, there was evidence that at all school levels participants had the greatest difficulty in identifying the correct verb in mathematics, whereas the easiest domain was folk psychology for the younger children, history for the middle school level, and both history and folk psychology for the oldest subjects.

As far as the effects due to the country were concerned, if we examine global performances (by combining responses given under each school level), we can observe that Italians outperformed Canadians in all the 9 verbs in folk psychology and in 6 out of 9 verbs both in history and mathematics. Also this analysis showed that differences between the two countries are larger in folk psychology than in the other domains. If we collapse responses given in each school level in the three domains, we notice that in Primary School Grade 3 Canadian outperformed Italian students in 12 cases, whereas Italians outperformed Canadians in 14 cases (in 1 cases they obtained the same response rate); in Primary School Grade 5 Canadian outperformed Italian students in 8 cases whereas Italians outperformed Canadians in 19 cases; in Junior High Grade 7 Canadian outperformed Italian students in 7 cases whereas Italians outperformed Canadians in 20 cases. In sum, differences between the two countries increased along with grade level.

A first finding of the study was that metarepresentational abilities show some development with age but are quite limited even in Junior High School students. Furthermore they vary in a widely across verbs. Total scores give an overall picture of the ability to recognise the meaning of metalinguistic and metacognitive verbs but hide interesting differences among verbs which the present study has allowed us to highlight. Variations in correctly identifying the mental verbs are likely to depend more on a strong variability among the meanings of the mental terms employed in the study than on the variability among the steps followed in the acquisition of a mental lexicon. A possible explanation stresses the influence of the context of the stories and of the alternative verbs offered in each case on the identification of the correct synonyms for the general mental verbs. Whichever explanation we adopt, variability might be connected with the discursive practices appropriate to specific situations.

Variability in performance allowed us to rank metacognitive verbs from the easiest to the most difficult to be identified as follows (see Table 2, total scores): to assume, to doubt, to hypothesise, to infer, to remember. This ranking could be explained by referring to the different use frequencies of metarepresentational verbs in, respectively, everyday speech and school speech. However, this seems not to be the case because, for example, to infer - which is seldom used in everyday language but sometimes occurs in school language - is recognised at the same extent as to doubt - which is often used also in common language. A possible alternative explanation is that talking about the already available knowledge (e.g., memories) is easier than talking about the construction of knowledge itself (e.g., inferences). In other words, considering the particular set of the verbs analysed in this study, we can say that mental verbs like "to infer" elicit the idea of a mind which is building knowledge (that is a process), whereas verbs like to remember mainly refer to the existing products of cognition. As far as the patterns of responses to each verb within each domain (Table 3) was concerned, we can observe that the relative degree of difficulty varies according to the domain. For instance, the verbs *to doubt* and *to hypothesise* are the most poorly recognised verbs within mathematics at all school levels, presumably because this subject is perceived by students as the domain of certainty and not of conjectural knowledge. Conversely, regards history *to infer* and *to hypothesise* are the best recognised verbs at all school levels because it is likely that in this domain argumentation is prevalently conjectural. An interesting finding concerns the verb *to remember*. Even though such a verb is one of the best recognised verb in general (Table 2), at each school level it is the worst within the folk psychology domain and the best within mathematics: this suggests that *to remember* is conceived by pupils as the typical "school" verb, connected with the traditional instructional activities (to study and to remember).

A further evidence regarding the development of metarepresentational awareness concerns the different trend shown by Canadian versus Italian students: it seems that Italian students improved in performance across school levels to a larger extent than Canadian ones. This difference might derive from: (1) linguistic factors, (2) test factors, (3) use-frequency factors, and (4) instructional factors.

1. The different structures of the English and Italian language might affect performance in the task; for instance, the items did not contain phrasal verbs which are typical for English but not for Italian.

2. Italian students might get an advantage from the fact that the test material was originally written in Italian and then translated into English (even though the accuracy of the English version was controlled through the back-translation procedure).

3. A crucial factor could be the different use frequency of the mental verbs used in the test within each country; for example, in some cases in English, but not in Italian, a more colloquial verb is available to replace a technical verb which was employed (e.g., "to figure out" or "to guess" instead of "to infer").

4. The specific frequency can interact with instructional variables which are cultural in nature, such as the different educational practices of the two countries, curricula, organisational characteristics of the school systems, teachers' course of study, evaluation criteria.

Table 3 - Mean Numbers of Correct Answers for each Verb under each Domain in each School Level (Second Study)

Verb	Domain											
	Folk Psychology				History				Mathematics			
	Primary School Grade 3	Primary School Grade 5	Junior High School Grade 7	Tot	Primary School Grade 3	Primary School Grade 5	Junior High School Grade 7	Tot	Primary School Grade 3	Primary School Grade 5	Junior High School Grade 7	Tot
Metacognitive Verbs												
to doubt												
Canada	0.64	0.40	0.25	0.42	0.47	0.50	0.47	0.48	0.09	0.24	0.16	0.17
Italy	0.40	0.60	0.40	0.47	0.21	0.30	0.42	0.31	0.05	0.55	0.55	0.38
Total	0.52	0.50	0.32	0.44	0.34	0.40	0.44	0.39	0.07	0.39	0.35	0.27
to hypothesise												
Canada	0.07	0.13	0.06	0.09	0.40	0.50	0.40	0.43	0.09	0.18	0.11	0.13
Italy	0.20	0.55	0.70	0.48	0.11	0.20	0.53	0.28	0.05	0.05	0.10	0.07
Total	0.13	0.24	0.38	0.28	0.25	0.35	0.46	0.35	0.07	0.11	0.10	0.10

table 3 cont.

Verb	Domain											
	Folk Psychology				History				Mathematics			
	Primary School Grade 3	Primary School Grade 5	Junior High School Grade 7	Tot	Primary School Grade 3	Primary School Grade 5	Junior High School Grade 7	Tot	Primary School Grade 3	Primary School Grade 5	Junior High School Grade 7	Tot
to infer												
Canada	0.21	0.20	0.56	0.33	0.47	0.58	0.40	0.48	0.27	0.41	0.37	0.36
Italy	0.15	0.55	0.50	0.40	0.11	0.30	0.42	0.28	0.30	0.45	0.45	0.40
Total	0.18	0.37	0.53	0.36	0.29	0.44	0.21	0.38	0.28	0.43	0.41	0.38
to predict												
Canada	0.21	0.20	0.56	0.33	0.20	0.42	0.67	0.43	0.27	0.41	0.42	0.38
Italy	0.35	0.50	0.60	0.48	0.21	0.70	0.58	0.50	0.20	0.15	0.15	0.17
Total	0.28	0.35	0.58	0.40	0.20	0.56	0.62	0.46	0.23	0.28	0.28	0.27
to remem-ber												
Canada	0.36	0.47	0.31	0.38	0.60	0.42	0.40	0.48	0.64	0.41	0.32	0.43
Italy	0.30	0.40	0.55	0.42	0.47	0.75	0.58	0.60	0.60	0.75	0.85	0.73
Total	0.33	0.43	0.43	0.40	0.53	0.58	0.49	0.54	0.62	0.58	0.58	0.58
Metalinguistic Verbs												
to admit												
Canada	.07	.20	.13	.13	.07	.42	.47	.31	.18	.24	.26	.23
Italy	.80	.75	.65	.73	.58	.75	.79	.71	.40	.50	.65	.52
Total	.43	.47	.39	.43	.32	.58	.63	.51	.29	.37	.45	.37
to assume												
Canada	.43	.53	.81	.60	.47	.50	.67	.55	.36	.53	.84	.62
Italy	.80	.70	.70	.73	.47	.55	.68	.57	.40	.30	.50	.40
Total	.61	.61	.75	.56	.47	.52	.67	.56	.38	.41	.67	.51
to conclude												
Canada	.21	.27	.56	.36	.20	.00	.47	.24	.27	.18	.32	.26
Italy	.25	.50	.70	.48	.21	.15	.53	.29	.00	.30	.55	.28
Total	.23	.48	.63	.42	.20	.07	.50	.26	.13	.24	.43	.27
to confirm												
Canada	.43	.43	.63	.50	.33	.67	.40	.45	.18	.24	.37	.28
Italy	.45	.50	.65	.53	.47	.55	.79	.60	.40	.45	.70	.52
Total	.44	.42	.64	.51	.40	.61	.54	.52	.29	.34	.53	.40

2.5 A CROSS-CULTURAL COMPARISON BETWEEN THREE COUNTRIES: ITALY, SERBIA, TANZANIA

A third study was carried out to compare country which differ in a larger extent than the two previously considered. The variables taken into account in this investigation were, as in the previous studies, different grades of schooling (from primary school to the university) and different domains of knowledge (folk psychology, history, mathematics). Participants belonged to the following countries:

- Italy (students living in Milan and in neighbourhood);
- Serbian Republic (students attending schools in Beograd)[6];
- Tanzania (participants come from three schools in the villages of Did^a and Bug^si, near the city Shinyànga, in the north-western part of the country.[7]

The same test used in the previous studies was employed. It was translated both in Serbo-Croatian and in Swahili by following the same procedure (backward translation) adopted for the translation form Italian to English.

After the experimenters has been training, the test has been administered to the selected groups. The data which allowed us to compare Italy and Serbia were obtained from the following subgroups of participants:

	Primary School Grade 3	Primary School Grade 5	High Junior High School Grade 7	University	Whole sample
ITALY	41	52	31	53	177
SERBIAN REPUBLIC	26	18	25	47	116

In Tanzania the subgroups of participants were differently structured than in Italy and in Serbia depending on the particular aspects of schooling in that country. In Tanzania the formal educational system consists of: a 7-year primary stage, beginning when pupils are seven-year-old; a 6-year secondary stage, which starts passing a selection mainly based on

[6] We thank Dr. Luca Valtorta for contacting the schools participating in the study and for test administration.

[7] We thank Dr. Eleonora Riva for finding the schools participating in the research and for test administration.

evaluations achieved in primary stage; and vocational education and university studies of varying length. Even though the general structure of the school system is not very different from Italy and Tanzania, the congruence between students' age and class attended is very weak. In fact in Tanzania pupils can start attending school one or two years after the due time of seven years of age for different reasons: the school building is too far away from home and parents prefer to wait their son/daughter growing up to send him/her to school; a school is built nearby the house and the child, who did not go to school when he/she was seven-eight –year-old because of the distance, starts now in the new school. Entering secondary school can be delayed for the same reasons, or to get the opportunity given to pupils to repeat primary school's courses to achieve better evaluations so passing the selection. Furthermore private secondary schools often offer students one year of preparation to the school itself. Finally it is worth noticing that the Tanzanian education suffers of various difficulties, among them: teacher absenteeism, large classes, high student dropout rate, gender inequality, poor academic achievement (Malmberg, Wanner, Sura & Little, 2001).

In consideration of these characteristics of the Tanzanian students, the test was administered in primary stage starting from Grade 3 (since the two preceding grades are devoted to early literacy) and in every class of the secondary stage. In Tanzania 518 subjects took part in the study, divided between primary and secondary schools as follows:

TANZANIA	SCHOOL LEVEL. 1 Primary 3-4-5	SCHOOL LEVEL 2 Primary 6-7	SCHOOL LEVEL 3 Secondary 1	SCHOOL LEVEL 4 Secondary 2	Total
Age Level 1 (7-13 yrs.)	106	21	2	-	127
Age Level 2 (14-15 yrs.)	27	61	46	-	144
Age Level 3 (16-17 yrs.)	5	14	80	23	124
Age Level 4 (18-22 yrs.)	-	5	53	75	133
Total	138	101	181	98	518

By considering percentages of correct responses in each verb, if we focus on the Italy-Serbia comparison, we observe a decreasing order which shows both analogies and differences between the two countries. In the Italian sample the hierarchy was the following: *to admit*, *to conclude*/*to remember*, *to assume*, *to predict*, *to doubt*. In Serbia the following decreasing order was found: *to admit*, *to conclude*, *to assume*, *to predict*/*to remember*, *to doubt*. *To admit*, an affirmative verb expressing certainty, is in

the first position (that is, it is well recognised) in both countries, whereas the verb *to doubt*, expressing a mental state of uncertainty, appears at the bottom of the hierarchy both in Italy and in Serbia. By contrast, the verb *to remember* belongs to the best recognised verb in Italy but not in Serbia. If we consider similarities and differences between the two countries in identification rates of each verb at various school levels and/or with respect to the specific domain of knowledge, we notice the following relations: the recognition of the verb *to admit* increased regularly through school level both in Italy and in Serbia, while *to doubt* increased progressively along school level in Serbia but not in Italy. *To assume* was better recognised in Grade 5 of the Primary School and in the Grade 7 of the Secondary School in Italy but only in the Primary School in Serbia. *To conclude* was better understood in history in Serbia and in folk psychology in Italy. It is above all in Serbia that the verb *to remember* appeared to be highly recognised in mathematics as compared to the other domains, thereby indicating the association between such a discipline and memory. *To predict* is better identified in history in Serbia, and in folk psychology in Italy.

If we focus on the Tanzanian sample, we observe the following trend: in all verbs percentages of correct recognition were homogeneously low. In general, if we collapse responses given to all verbs, we notice that Serbian students performed similarly to Italian students, while in Tanzania response rates were near to the chance level (see Figure 1).

If we distinguish among the domains of knowledge, verbs were better identified within folk psychology and worse identified in mathematics both in Italy and in Serbia. However, in Serbia performance in folk psychology was worse and in history and mathematics was better than in Italy. In Tanzania no differences among domains were found.

As regards the school level, in Italy response rates increased progressively; in Serbia the difference between the Grade 5 of the Primary School and the Grade 7 of the Secondary School is smaller than in Italy. In Tanzania no developmental trend emerged.

If we analyse the interaction between the domains of knowledge and the school level, in Italy percentages of correct answers in history and mathematics were similar (and lower than in folk psychology), whereas in Serbia correct answers in history were, at the 5th Grade of Primary School, even higher than in folk psychology and, in the 3rd Grade, only slightly lower than folk psychology.

In Tanzania no interaction effects occurred. Nevertheless, in no country were interactions between domains and grade of schooling statistically significant.

The puzzling finding of the third study was the uniformity of incorrect responses recorded in Tanzania. A possible explanation is that the task was meaningful for the western countries but not for other cultures.

Maybe the metarepresentational verbs included in the task are too unusual or technical in Tanzania or that in such a country the use of the verbs proposed by the task is differentiated on the basis of indigenous linguistic and conversational conventions rather than on the actual understanding of the terms. It is unlikely that metarepresentational activity fails to occur.

It is worth noticing that in Italy and Serbia, as well as Canada, similar rates of comprehension of metacognitive and metalinguistic verbs occur, both in reference to school level and to domain of knowledge. Differences found between Italy and Serbia as regards the domain can be explained by making reference to differences in the school systems or in the present socio-political conditions. This, for instance, could explain why verbs were better recognised in history in Serbia than in Italy: the ethnic conflicts and the consequent socio-political instability could make people more sensitive to the past events of their country and to the interpretation of the current facts and actions from a historical perspective. Nevertheless, a common way of understanding the mental activity underlying the meaning of the metarepresentational verbs seems to characterise performance in western countries, perhaps because of the similarity of their school systems.

2.6 CONCLUSIONS

A first finding of our investigation regards the developmental trend. Total scores computed revealed that in each domain metarepresentational competencies increase across school levels. However, significant differences in mean total scores emerged in all domains only between Primary School Grade 3 children and the older ones. We can hypothesise that Primary School Grade 3 children significantly differed in performances from the pupils of subsequent levels of schooling because performances we are dealing with are strongly connected with two important kinds of events occurring at this age level. On one side, in the first school years children are confronted with the formal processes of instruction and the connected ways of managing the questions of knowledge and mind from a "meta" level. That is to say that the child meets with a new or almost new way of thinking whose frameworks lie in the epistemological structures of the various disciplines. These structures induce students to grasp the role of the specificity of the different symbolic systems and to reflect on the different modes of representing reality. This way of thinking will be systematically applied during compulsory schooling, as opposed to what happens in the family or in nursery school. For these reasons, during the first years of school, metarepresentational performances become commonplace.

Anyway, it is reasonable to assume that after three or four years of age a kind of apprenticeship begins in which the child's participation in the

activity of thinking and talking about the topics of knowledge and mind takes on a form which will be maintained for the whole school period. On the other hand, we must think that for eight-year-olds (age which corresponds to the Grade 3 of Primary School) second order metarepresentational ability (X believes that Y believes p) represents a very recent acquisition (emerging between five and seven years of age; see Wimmer & Perner, 1983) and thus it is not well mastered, while older pupils have mastered that ability. The acquisition of this ability would positively affect learning in disciplines as ways of thinking, since it is significantly associated to epistemological development, particularly with competence in reasoning about evidence and understanding inference (Astington, Pelletier & Homer, 2002). Furthermore, improved recursive thinking might significantly influence the metarepresentational ability involved in mental verb identification. The observed developmental trend can be also be interpreted in terms of advance from implicit understanding (often contextually based) to explicit knowledge of the metarepresentational verbs (very seldom completely achieved in our sample) (Olson, 1994).

A second finding concerns knowledge domains. As only one item tested each domain any inferences must be seen as conjectures. The higher increase in performances in folk psychology and history in comparison with mathematics - which is evident in western countries - might depend on the fact that the former are more strictly connected than the latter with everyday discursive practices. In fact, the lexicon of psychology and history, but not of mathematics, greatly overlaps common language; furthermore, psychological and historical but not mathematical thinking tends to include features of narrative, rather than paradigmatic, thought which is privileged by the ordinary speech. Moreover the best and most precocious performance in folk psychology in comparison with the performance in the other two domains of knowledge can be connected with the fact that we could refer to folk psychology as the first domain of knowledge children become familiar with. In fact, by considering the development of theory of mind, one may hypothesise that, if children are able to deal with desires psychology from two years of age (and consequently to master some mental verbs), then they may have a familiarity with the folk psychology domain at the ages here considered. Later on, other domains will appear, such as history and mathematics, that will be shaped by curricula encountered in the school environment. Between these two domains, mathematics as taught at school represents the field which is least like the narrative thought of everyday psychology, while history is the most.

A third line of evidence emerging from our studies concerns the differences among countries. The most relevant difference separates European and North American countries, on one side (Italy, Canada and Serbia), from Tanzania, on the other side. In fact in western countries we can

observe changes in performances depending on age (developmental trend) as well as on domains of knowledge (folk psychology, history, and mathematics). On the contrary, in Tanzania performances remain at chance level. This suggests that the mental language task proposed is not culture-free. We can hypothesize that Tanzanian pupils find our task puzzling and unmeaningful. These were the only groups of subjects who were tested in a foreign language.

We must remember that in Tanzania secondary school pupils study English (Malmberg, Wanner, Sumbra & Little, 2001), so have the opportunity to meet Western thought, while in primary school the language of instruction is Swahili; nonetheless, even secondary school students gave responses at the chance level similar to primary school children. Lillard's (1998) review of theory of mind across cultures showed relevant differences between Western *vs.* non-Western cultures in concepts as "mind", "relationship between mind and behaviour" and "influences on mind". These differences would make the learning of English terms for "mind" quite different and would explain poor test performance.

A last consideration is about methodology. We found a remarkable range of variability in the acquisition of mental verbs even within the same domain of knowledge or the same group of subjects. It can partially depend on the heterogeneous nature of the verbs considered: in fact the epistemic verbs included in our task are not classified on the basis of use frequency in a specific country or domain of knowledge and, more in general, on the basis of criteria that can be used to establish relationships among the verbs. This problem should be taken into account in further studies.

To conclude, we would like to point out that the research on the acquisition of mental verbs would profit from the knowledge of the language really spoken at home and at school in the curricular subjects or, to say it with other words, from the knowledge of the use of mental language in the different school subjects in different school levels and in different countries. This knowledge would give us the picture of the mental language that the school proposes to the child and which it asks him/her to take part in.

APPENDIX

Instructions

The words "think" and "say" are very common and we use them all the time to refer to various ways in witch we do or think something. For instance, if I say "I think I will be late" it is not understood whether or not I am certain to be in late; whereas if I say "I know I will be in late" it is clear that I am positive about it. Instead if I say "I foresee that I will be in late" it means that I am not totally sure about it.

In the following pages you will find a series of short stories in which a character thinks or says something. The situations refer to day-to-day life, history, or mathematics. First of all, you should read the short story and then the four possible answers. In each answer the word "think" or "say" (which are underlined in the story) are substituted by a more precise word. Therefore, you should choose which of the four sentences is the one in which the word "think" or "say" is best replaced. Please mark your choice with a cross.

The questionnaire is anonymous and you will not be evaluated for it. In other words, it is not a test and you will not get a mark at the end. However, you should answer each question accurately and make sure that you have marked one answer per story.

Folk Psychology

1. John and Claire, a brother and sister, are playing in their room with a toy train. At some point Claire feels thirsty and goes to the kitchen to get a drink. While Claire is in the kitchen, John takes the toy train to the living room because there is more room to play there. Claire comes back and looks for the toy train in her room where she had left it. Indeed, Claire thinks that the toy train is in their room.

a) Indeed Claire remembers that the toy train is in their room
b) Indeed Claire hypothesises that the toy train is in their room
c) Indeed Claire demonstrates that the toy train is in their room
d) Indeed Claire discovers that the toy train is in their room

2. Marc and Anne have to look after their younger brother, Peter because their mother has gone out. At some point Pier starts to cry. Anne says: "As a child when I use to cry, my mother sang and I stopped. Let's sing a song for Pier to make him stop crying". Marc, instead thinks that the song will not make Pier stop crying. Anne sings but Pier keeps on crying.

a) Marc assumes that the song will not make Pier stop crying
b) Marc discovers that the song will not make Pier stop crying
c) Marc demonstrates that the song will not make Pier stop crying

d) Marc doubts that the song will not make Pier stop crying

3. Simon notices that his brother Paul always stops in front of the windows of shops where video games are sold. On Paul's birthday his parents say to Simon: "For Paul's birthday we have bought a video game. We wonder if we have made a good choice". Simon says that Paul will be very pleased.
a) Simon predicts that Paul will be very pleased
b) Simon confirms that Paul will be very pleased
c) Simon suggests that Paul will be very pleased
d) Simon defines that Paul will be very pleased

4. Carl and some of his friends are playing hide-and-seek. Now it's Carl turn to seek his friends who are hiding. Lucy wants to trick Carl. So, she lets her red scarf fall in front of the bathroom door and then she goes to hide in the kitchen. Carl thinks that Lucy is hiding in the bathroom if her scarf has fallen in front of the bathroom door.
a) Carl infers that Lucy is hiding in the bathroom
b) Carl believes that Lucy is hiding in the bathroom
c) Carl knows that Lucy is hiding in the bathroom
d) Carl hypothesises that Lucy is hiding in the bathroom

5. It is the last day of school. Monique's mother goes to pick her up at school and she thinks that Monique is happy because the holidays are about to begin. When Monique comes out her mother sees that she is not smiling and so she asks her what has happened. Monique says that she is happy because the holidays are about to begin, but she is also sad because she won't see her schoolmates for three months.
a) Her mother remembers that Monique is happy because the holidays are about to begin.
b) Her mother assumes that Monique is happy because the holidays are about to begin.
c) Her mother understands that Monique is happy because the holidays are about to begin.
d) Her mother believes that Monique is happy because the holidays are about to begin.

6. Magdaleine is watching a movie on TV. There is a thunderstorm and the movie is interrupted just before the policeman was to find out who had robbed the bank. So Magdaleine tries to guess who is guilty and it seems to her that the postman might be the one. Next day, Magdaleine meets Tom who has watched the whole movie and she says to him that in her opinion the postman is guilty. Tom says that she is right: the postman was guilty.
a) Tom confirms that the postman was guilty

b) Tom concludes that the postman was guilty
c) Tom asserts that the postman was guilty
d) Tom explains that the postman was guilty

7. Laurie asks her mother if she can go to the park with her friends. Her mother gives her permission but she forbids her to eat ice cream and candies because Laurie has had stomach ache the whole morning. When Laurie comes back her mother sees that she has a chocolate stain on her T-shirt and therefore her mother thinks that Laurie has eaten an ice cream.
a) Her mother doubts that Laurie has eaten an ice cream
b) Her mother infers that Laurie has eaten an ice cream
c) Her mother knows that Laurie has eaten an ice cream
d) Her mother understands that Laurie has eaten an ice cream

8. Samuel's mother tells him that he can go out with his friends, but he has to be home by six o'clock. Samuel comes home at eight o'clock and his mother scolds him for having disobeyed her. At first Samuel says that he had not heard his mother ask him to come back by six o'clock, but then Samuel says that he has disobeyed.
a) Samuel concludes that he has disobeyed
b) Samuel explains that he has disobeyed
c) Samuel concedes that he has disobeyed
d) Samuel suggests that he has disobeyed

9. Claudia shares a secret with George and tells him not to tell anybody. The next day at school another classmate mocks Claudia telling her that he knows everything about her secret. Since Claudia had told it only George, she says that it was George who revealed her secret.
a) Claudia concedes that it was George who revealed her secret
b) Claudia defines that it was George who revealed her secret
c) Claudia concludes that it was George who revealed her secret
d) Claudia asserts that it was George who revealed her secret

History

1. Last week his teacher had explained to Bruce that at some point in European history people began to move to cities from the countryside to find work. This week there is a test. The first question is: "Why did people begin to move to cities from the countryside?". Bruce thinks that this happened because people could find jobs in the cities.
a) Bruce remembers that this happened because people could find jobs in the cities.

b) Bruce hypothesises that this happened because people could find jobs in the cities.
c) Bruce demonstrates that this happened because people could find jobs in the cities.
d) Bruce discovers that this happened because people could find jobs in the cities.

2. Jennifer and Duane are looking through a history book on Ancient Egypt. On one page there is the picture of a strange statue. According to Duane the statue represents a tiger, whereas Jennifer thinks that it is not a tiger. While they are discussing it, Jennifer and Duane realise that beneath the picture it is explained that the statue represents the Sphinx.
a) Jennifer assumes that it is not a tiger
b) Jennifer discovers that it is not a tiger
c) Jennifer demonstrates that it is not a tiger
d) Jennifer doubts that it is a tiger

3. The teacher has explained that Napoleon used to win battles because he had a great deal of military experience. Now the students are reading in class the story of a battle fought by two armies, one led by a general with much experience, and the other led by a young general. The teacher asks: "In your opinion who's going to win the battle?" Luis says that the battle will be won by the older general.
a) Luis predicts that the battle will be won by the older general
b) Luis confirms that the battle will be won by the older general
c) Luis suggests that the battle will be won by the older general
d) Luis defines that the battle will be won by the older general

4. Strolling along the lake shore, Charles and his father get to the CN tower. Charles looks at the top of the tower and his father tells him that it is 512 meters high. His father also says that the CN tower is the tallest building in the world. The next day, Charles's teacher asks: "What is the tallest building in the world?" Charles says that the CN tower is the tallest building.
a) Charles infers that the CN tower is the highest building
b) Charles believes that the CN tower is the highest building
c) Charles knows that the CN tower is the highest building
d) Charles hypothesises that the CN tower is the highest building

5. The teacher tells the students that the Vikings were capable of building sailing ships. Since Claire thinks that the Vikings lived in the middle of the desert, she asks: "What did they build those ships?" The teacher explains to Claire that the Vikings used to live along the coast and they used the ships for war.
a) Claire remembers that the Vikings lived in the middle of the desert

b) Claire assumes that the Vikings lived in the middle of the desert
c) Claire understands that the Vikings lived in the middle of the desert
d) Claire knows that the Vikings lived in the middle of the desert

6. A class is visiting the Museum of steam engines. The guide explained that these locomotives worked by burning coal; this is the reason they produced so much smoke. Victoria then remarks that the walls of the old stations must have been black with smoke. Jim says that is exactly the case: in a picture which hangs on one of the museum walls one can see clearly how dirty the smoke made the stations.
a) Jim confirms that is exactly the case
b) Jim concludes that is exactly the case
c) Jim asserts that is exactly the case
d) Jim explains that is exactly the case

7. In studying history, Terry has learned that when a group of people does not like where they live, they move and settle in a better place. Furthermore, he has read that during the Middle Ages Italy was invaded by a barbarian population that came from northern Europe. Terry thinks that they have settled in Italy because they liked it there.
a) Terry doubts that they have settled in Italy because they liked it there
b) Terry infers that they have settled in Italy because they liked it there
c) Terry knows that they have settled in Italy because they liked it there
d) Terry understands that they have settled in Italy because they liked it there

8. Manuela is asked some questions on history. The teacher asks her in which year America was discovered and she answers: "In 1429". The teacher corrects her: "You mean in 1492". "No, no, it was discovered in 1429" Manuela insists. "No, Manuela you are wrong. America was discovered in 1492", the teacher corrects her again. "I am not wrong; the book says 1429". When all her classmate show her that the book actually says that America was discovered on 1492, Manuela says that she is wrong.
a) At the end Manuela concludes that she is wrong
b) At the end Manuela explains that she is wrong
c) At the end Manuela concedes that she is wrong
d) At the end Manuela suggests that she is wrong

9. In history class the teacher invited the students to look at the map of the United States carefully in order to answer her questions. "Where was the city of New York built?" Joseph answers: "On the coast of the Atlantic Ocean". "Where was the city of Los Angeles built?" On the coast of the Pacific Ocean, Paula answers. "Where was the city of Chicago built?" "It was built on the coastline of Lake Michigan", Christine answers. At this

point Mike says that the biggest cities in the USA have been built on the coast of either an ocean or a large lake.
a) Mike concedes that the biggest cities in the USA have been built on the coast of either an ocean or a large lake.
b) Mike defines that the biggest cities in the USA have been built on the coast of either an ocean or a large lake.
c) Mike concludes that the biggest cities in the USA have been built on the coast of either an ocean or a large lake.
d) Mike asserts that the biggest cities in the USA have been built on the coast of either an ocean or a large lake.

Mathematics

1. Last week the teacher explained to David that to double 6 one can multiply 6 by 2. Today the teacher asks David: "How do you double 6?". David thinks that he can multiply 6 by 2.
a) David remembers that he can multiply 6 by 2
b) David hypothesise that he can multiply 6 by 2.
c) David demonstrates that he can multiply 6 by 2.
d) David discovers that he can multiply 6 by 2.

2. Mary and George are studying the multiplication tables. When they have to multiply seven by eight, Mary says the answer is 54; however George thinks that 54 is wrong. Therefore they look into the book and see that 7 times 8 is 56.
a) George assumes that 54 is wrong
b) George discovers that 54 is wrong
c) George concludes that 54 is right
d) George doubts that 54 is right

3. The teacher is asking the children some questions. She has a question for each student. The teacher asks Carl: "Without doing any calculations, if you earn three times seven tokens and I earn twice seven tokens, which one of us will have fewer tokens? Carl says that the teacher is going to have fewer tokens.
a) Carl predicts that the teacher is going to have fewer tokens.
b) Carl confirms that the teacher is going to have fewer tokens.
c) Carl suggests that the teacher is going to have fewer tokens.
d) Carl defines that the teacher is going to have fewer tokens.

4. John has in front of him a set of hockey cards. He counts the cards from the first to the last: there are six. After that, John recounts them from the last to the first: there are six. Then, he throws them and while they are falling down he counts them one after the other and again there are six.

Therefore, John thinks that, in whatever ways he counts his cards, the order does not matter.
a) John, therefore, infers that the order does not matter
b) John, therefore, believes that the order does not matter
c) John, therefore, knows that the order does not matter
d) John, therefore, hypothesise that the order does not matter

5. Katy has a younger sister who likes counting. Usually, the younger sister counts to 10 correctly. Now she is counting and when she gets to 10 she stops and asks Katy: "What number comes after 10?". Katy thinks that her sister can't learn this. Therefore, she answers: "Don't worry about it. When you are older, you will learn it.
a) Katy remembers that her sister can't learn this.
b) Katy assumes that her sister can't learn this.
c) Katy understands that her sister can't learn this.
d) Katy believes that her sister can't learn this.

6. Robert is counting the numbers from 1 to 20 aloud in front of his mother. When he gets to 16, he stops and thinks for a while. He asks his mother: "Mom, does 17 come after 16?" His mother says that after 16 comes exactly 17.
a) His mother confirms that after 16 comes exactly 17
b) His mother concludes that after 16 comes exactly 17
c) His mother affirms that after 16 comes exactly 17
d) His mother explains that after 16 comes exactly 17

7. Janet and Sara are preparing some coloured - paper masks to celebrate the Carnival. Janet has cut out three red paper-masks and she shows them to Sara. Sara looks at them and then she says: "I haven't cut out as many masks as you have!". Therefore, Janet thinks that Sara must have cut out one or two masks.
a) Janet doubts that Sara must have cut out one or two masks.
b) Janet infers that Sara must have cut out one or two masks.
c) Janet knows that Sara must have cut out one or two masks.
d) Janet understands that Sara must have cut out one or two masks.

8. Dorothy and Peter are discussing the best way to double 7. Dorothy want to multiply 7 by 2; on the other hand, Peter claims that it is better to add 7 and 7 because it is easier to add the numbers. Dorothy says that it is true that it is easier to add the numbers, but she is going to multiply them.
a) Dorothy concludes that it is true that it is easier to add the numbers, but she is going to multiply them.

b) Dorothy explains that it is true that it is easier to add the numbers, but she is going to multiply them.
c) Dorothy concedes that it is true that it is easier to add the numbers, but she is going to multiply them.
d) Dorothy suggests that it is true that it is easier to add the numbers, but she is going to multiply them.

9. Three children have started collecting stamps. Steven wonders who has collected the most stamps. He knows that he has 4 stamps and Joseph tells him that he has 25 stamps and Anne has even more then he has. Steven says that Anne has collected the most stamps.
a) Steven that Anne has collected the most stamps.
b) Steven says that Anne has collected the most stamps.
c) Steven says that Anne has collected the most stamps.
d) Steven says that Anne has collected the most stamps.

REFERENCES

Antonietti A., Liverta-Sempio O., Marchetti A. Lo sviluppo del linguaggio mentale in psicologia ingenua, storia e matematica. Studi di Psicologia dell'Educazione 1998(a); 17: 170-203

Antonietti A., Liverta-Sempio O., Marchetti A. Mental verbs on language and thought: A developmental study in three domains of knowledge. XV Biennial Meeting of the ISSBD; 1998(b) July 1-4; Bern.

Astington, J.W. "What is theoretical about the child's theory of mind? A Vygotskian view of its development". In *Theories of Theories of Mind*, P. Carruthers, P.K. Smith, (Eds.), Cambridge University Press, Cambridge, 1996.

Astington J.W. Theory of mind goes to school. Educational Leadership 1998; 56, 3: 46-48.

Astington J.W., Gopnik A. Theoretical explanations of children's understanding of the mind. British Journal of Developmental Psychology 1991; 9: 7-31

Astington J.W., Olson D.R. Metacognitive and metalinguistic language: learning to talk about thought. Applied Psychology: An International Review 1990; 39: 77-87

Astington, J.W., Pelletier, J. "The language of mind: Its role in teaching and learning." In *The handbook of education and human development. New models of learning, teaching and schooling*, D.R. Olson, N. Torrance (Eds.) Cambridge, MA: Blackwell, 1996.

Astington J.W., Pelletier J., Homer B. Theory of mind and epistemological development: The relation between children's second-order false-belief understanding and their ability to reason about evidence. New Ideas in Psychology 2002; 20: 131-144

Bartsch, K., Wellman, H.M., *Children talk about the mind*, New York: Oxford University Press, 1995.

Booth J.R., Hall W.S. Role of the cognitive internal state lexicon in reading comprehension. Journal of Educational Psychology 1994; 86: 413-422.

Bretherton I., Beeghly M., Talking about internal states: the acquisition of an explicit theory of mind. Developmental Psychology 1982; 18: 906-921.

Bruner, J., *Actual Minds, Possible Worlds.* Cambridge: Harvard University Press, 1986.

Burr J.E., Hofer B.K. Personal epistemology and theory of mind: Deciphering young children's beliefs about knowledge and knowing. New Ideas in Psychology 2002; 20: 199-224.

Camaioni L., Longobardi E. Referenze a stati interni nella produzione linguistica spontanea a venti mesi. Età Evolutiva 1997; 56: 16-25.

Camaioni L., Longobardi E., Bellagamba F. Evoluzione dei termini di stati mentali nelle storie di fantasia scritte da bambini in età scolare. Età Evolutiva 1998; 60: 20-29.

Dunn, J. "Changing minds and changing relationships." In *Children's Early Understanding of Mind*, C. Lewis, P. Mitchell (Eds.), Hillsdale, NJ, Erlbaum, 1994.

Dunn J. Bretherton I., Munn P. Conversations about feeling states between mothers and their young children, Developmental Psychology 1987; 23: 132-139.

Dunn J., Brown J., Slomkowsky C., Tesla C., Youngblade L. Young children's understanding of other people's feelings and beliefs: individual differences and their antecedents. Child Development 1991; 62: 1352-1366.

Furrow D., Moore C., Davdige J., Chiasson L. Mental terms in mothers and children speech: Similarities and relationships. Journal of Child Language 1992; 19: 617-631.

Groppo M., Antonietti A., Ardino V., Liverta-Sempio O., Marchetti A., Olson D.R. The development of metarepresentational concepts in folk psychology, history and mathematics, Cognitive Processing 2000; 1: 99-117.

Groppo M., Antonietti A., Liverta-Sempio O., Marchetti A. Metalinguistic-metacognitive competence and literacy: A developmental study, *Redefining Literacy*, On-line, autumn, 1999; 1-5.

Hambleton R.K. Guidelines for adapting educational and psychological tests: a progress report, European Journal of Psychological Assessment (Bulletin of the International Test Commission) 1994; 10: 229-244.

Homer B., Olson D.R. Literacy and children's conception of language. Written Language and Literacy 1999; 2,1: 113-140.

Jenkins J.M., Turrell S.L., Kogushi Yuiko, Lollis S., Ross H.S. A longitudinal investigation of the dynamic of mental state talk in families. Child Development 2003; 74, 3: 905-920.

Lillard A. Ethopsychologies: Cultural variations in theories of mind? Psychological Bulletin 1998; 123, 1: 3-32.

Luria, A.R. *Cognitive development: Its cultural and social foundations.* Cambridge: Cambridge University Press, 1976.

Malmberg L.E., Wanner B., Sura S. Little T.D. Action-control beliefs and school experiences of Tanzanian primary school students. Journal of Cross-Cultural Psychology 2001; 32, 5: 577-596.

Misciones J.L., Marvin R.S., O'Brien R.G., Greenberg M.T. A developmental study of preschool children's understanding of the words "know" and "guess". Child Development 1978; 49: 1107-1113.

Olson, D.R. *The world on paper*. Cambridge University Press, Cambridge, 1994.

Olson D.R. Towards a psychology of literacy: on a relations between speech and writing. Cognition 1996; 60, 1: 83-104.

Olson, D.R. Critical thinking: Learning to talk about talk and text. In *Handbook of academic learning. Construction of knowledge*, G.D. Phye (Ed.), San Diego, CA: Academic Press, 1997.

Olson, D.R. *Psychological theory and educational reform. How school remakes mind and society*. Cambridge: Cambridge University Press, 2003.

Olson D.R., Astington J.W., Thinking about thinking: Learning how to take statements and hold beliefs. Educational Psychologist 1993; 28, 1: 7-23.

Olson D.R., Homer B. The child's conception of "word". Paper presented at the XXVI International Congress of Psychology, Montreal, 1996.

Olson D.R., Torrance N. Language, literacy, and mental states. Discourse Processes 1987; 10: 157-167.

Olson D.R., Torrance N. (Eds.), *Modes of thought. Explorations in Culture and Cognition.* Cambridge, MA: Cambridge University Press, 1996.

Shatz M. Theory of mind and the development of social-linguistic intelligence in early childhood. In C. Lewis, P. Mitchell (Eds.), *Children's early understanding of mind: origins and development*, LEA, Hillsdale 1994.

Shatz M., Wellman H.M., Silber S. The acquisition of mental verbs: a systematic investigation of the first reference to mental state, Cognition 1983; 14: 301-321.

Siegal, M., Peterson, C.C. "Conversazione, sviluppo cognitivo e teoria infantile della mente." In *Il pensiero dell'altro. Contesto, conoscenza e teorie della mente*, O. Liverta-Sempio, A. Marchetti (Eds.), Milano: Raffaello Cortina Editore 1995.

Sperber A.D., Devellis R.F., Boehlecke B. Cross-cultural translation: methodology and validation, Journal of Cross-Cultural Psychology 1994; 25, 4: 501-524.

Wellman H.M., Bartsch, K. Before belief: children's early psychological theory. In *Children's early understanding of mind: Origins and development,* C. Lewis, P. Mitchell (Eds.). Hillsdale, NJ: LEA, 1994.

Wellman H.M., Johnson C.N., Understanding mental processes: a developmental study of "remember" and "forget". Child Development 1979; 50: 79-88.

Wimmer H., Perner J. Beliefs about beliefs: Representation and constraining function of wrong beliefs in young children's understanding of deception. Cognition 1983; 13: 103-128.

Zanobini M., Scopesi A., Cattani A. L'uso dei termini mentali in differenti contesti interattivi. In *Processi comunicativi e linguistici nei bambini e negli adulti: prospettive evolutive e sociali*, A. Scopesi, M. Zanobini (Eds.), Milano: Angeli 1998; 75-92.