Chapter 4

RELATIONS AMONG THEORY OF MIND, METACOGNITIVE LANGUAGE, READING SKILLS AND STORY COMPREHENSION IN L1 AND L2 LEARNERS

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This chapter describes how reading skill and reading comprehension were shown to relate to metacognitive factors such as theory of mind and metacognitive language in two empirical studies in Toronto, Canada. L1 children spoke English as a first language and L2 children spoke English as a second language. Study 1 examined these factors in Grade 4 (8-9 year olds) who spoke English or Portuguese as a first language. Study 2 examined these factors in L1 and L2 Kindergarten-Grade 2 (4-7 year olds) who spoke English, Cantonese, Tagalog or Ukrainian as a first language. All children were being schooled in English.

4.1   BACKGROUND TO STUDY 1 AND STUDY 2

Research in theory of mind is increasingly moving in the direction of applications to education such as how theory of mind relates to children's early success in school (Astington, 1998; Astington & Pelletier, 1999). For example, we know that theory of mind is related to children's ability to infer intentions and behavior, including the mental states and behaviour of story characters (Pelletier & Astington, 2004; Peskin & Astington, 2004). Theory of mind has likewise been shown to relate to children's epistemological understanding such as realizing that evidence is a reason for knowing (Astington, Pelletier & Homer, 2002). This kind of prerequisite ability is in turn required for scientific understanding (Kuhn & Pearsall, 2000).

We also know that children's general language development is closely related to theory of mind understanding and in some studies has been shown to predict theory of mind performance (Astington & Jenkins, 1999; Cutting & Dunn, 1999). Ruffman et al. (2003) showed that features of language development such as syntax and semantics predict theory of mind understanding. Many studies report the primacy of vocabulary development to theory of mind understanding (e.g. Astington & Pelletier, 1999; Lohmann & Tomasello, 2003). A specialized form of language development, one that relates to mental state understanding, may be necessary for children to describe the mental states of others, such as those of story characters. It is this "language of mind" (Astington & Pelletier, 1996) that allows children to understand characters' beliefs and intentions and at higher levels, authorial intention. Indeed, a study that empirically examined the relation between Bruner's (1986) 'landscapes of action and consciousness' showed that children are able to coordinate mental state understanding with story action when they understand and use metacognitive language in retelling stories (Pelletier & Astington, 2004). Specifically, this metacognitive language gives labels to mental states such as thinking, knowing, believing, wondering and dreaming. It is related to children's ability to take sentential complements, for example, knowing "that X believes something to be true" or "thinking that a character doesn't know something" (Naigles, Hohenstein & Marsland, 1997; de Villiers, 2000; Hale & Tager-Flusberg, 2003; Lohmann & Tomasello, 2003).

For second language learners there are certain predictors of reading success that relate to specific factors in second language oral proficiency (Cummins, 1979; Clarke, 1980; Saville-Troike, 1984; Wong Fillmore & Valdez, 1986). An additional factor explored in the present studies was the level of metacognitive awareness. Carrell, Gajdusek & Wise (1998) based their work on the belief that L2 learners require explicit metacognitive training in reading. Tang & Moore (1992) showed that providing English Second Language (ESL) emergent readers with metacognitive training was

more effective in raising reading comprehension levels than providing pre-reading activities, and in fact was associated with higher levels of retention. Gernsbacher, Hallada & Robertson (1998) showed that readers require high levels of metacognitive understanding in order to make inferences about story characters' emotional states. High-knowledge readers generate richer mental state models than low-knowledge readers, pointing to the importance of having language to talk about mental states (Barry & Lazarte, 1998). It has been shown that mental state inferencing is difficult in reading comprehension activity (Bahri & Al-Hussein, 1997). One reason for this may be that while children are expected to know about reasoning, teachers may not necessarily be given instructions in how to teach children to talk about thought (Franks, Mulhern & Schillinger, 1997). This is particularly salient for teachers of second-language learners who may not "pick up" this kind of language outside of the classroom. Children require language-specific knowledge before they can be expected to employ higher-level metacognitive strategies during reading; specifically, it has been shown that metacognitive knowledge is related to reading comprehension in both first and second languages (Schoonen, Hulstijn & Bossers, 1998). Fitzgerald (1995) claims that second language readers do recognize and use metacognitive vocabulary and metacognitive strategies in monitoring their reading comprehension. However, Jimenez, Garcia & Pearson (1995) argue that unknown vocabulary obstructs comprehension for L2 readers.

These findings point to the important role of metacognitive factors in L2 children's ability to carry out higher order comprehension processes in reading and in listening to stories. In order to access story characters' thoughts and intentions, children need to understand the language that gives labels to mental states, language such as think, plan, trick and so on. This type of language may be particularly difficult for L2 learners to acquire as there is no simple pairing of vocabulary with object, agent or action. In Canada specifically, and for most of North America more broadly, many children begin school speaking a language other than English, which is typically the language of schooling. In fact, in many areas in Toronto, Canada, at least 50% of school-age children do not speak English as a first language. Thus it is important to understand how language development in general, and metacognitive language in particular, relate to reading comprehension among L2 learners. In this way, educators can provide compensatory metacognitive instruction to better prepare children for reading. The two studies described in this chapter were carried out in Toronto, Canada, to examine this relation among Grade 4 children who spoke English or Portuguese as a first language, and among Kindergarten to Grade 2 children who spoke English, Cantonese, Tagalog and Ukrainian as a first language.

4.2   STUDY 1

The aims of Study 1 were to examine how theory of mind, metacognitive language, phonological processing and reading comprehension related to each other among L1 and L2 learners. In the province of Ontario, all school children undergo standardized achievement testing in Grades 3, 6 and 9. This study was designed to examine how metacognitive factors related to children's performance on the wide-scale reading achievement test in Grade 3. It was important to examine this relation for L1 and L2 learners in order to address the issue of whether L2 learners encounter more difficulty on standardized reading achievement tests because they do not understand the metacognitive language upon which many test items are based. In a related example, many items on the wide-scale mathematics achievement test ask children to "explain their thinking," "predict", "estimate", or "hypothesize". Children who do not understand the mental activities for which these labels stand have greater difficulty on such test items. On the reading comprehension subscales, test items may ask children to "infer" a character's "intention" based on the character's actions or "predict" what a character would do in another situation. These questions require children to have a theory of mind about story characters and to understand and use metacognitive language to make evaluations and inferences related to the story characters' actions. Thus it is important for educators to understand L2 children's understanding of both theory of mind and metacognitive language, as well as the relation between them vis-à-vis reading comprehension.

Study 1 was designed to include children who spoke either English as a first language or Portuguese as a first language from each of four achievement levels on the wide-scale achievement test taken the preceding year. All children were schooled in English and were drawn from 8 schools representing socioeconomic and cultural diversity. There were 79 Grade 4 children (mean age 9.5 years at time of study) (36 English FL – 20 girls and 16 boys, 43 Portuguese FL – 22 girls and 21 boys). The breakdown by achievement level was as follows: Level 1 (lowest) = 18, Level 2 = 22, Level 3 = 22, Level 4 = 17. The measures in Study 1 included:

the province-wide Reading Achievement Scores (Levels 1 - 4)

the Peabody Picture Vocabulary Test (standardized receptive vocabulary)

the Woodcock Reading Mastery Test (standardized) (word attack, word identification and passage comprehension subtests)

theory of mind: second order task (modified to make more difficult for older children) (e.g. one will character X think character Y will say?)

the Metacognitive Language Task (Astington & Pelletier, 2004): 12 metacognitive terms in forced choice format

Fables Task (Pelletier & Beatty, 2004): 2 story comprehension items. An example of a fable is as follows: A fox had fallen down a well. A thirsty goat walked by and the fox called out: "Come down here and taste this delicious water." The goat jumped right in and the clever fox climbed on the goat's back and got out of the well. The fox said, "Silly goat, if you had paid attention to where you were going you would not be stuck in the well." Children were asked 4 questions representing levels of understanding: Knowledge (who had fallen in the well?) Comprehension (why did the goat jump in the well?) Understanding of deception (is someone playing a trick? who?) Higher-level comprehension/evaluation (what is the moral/lesson of the story?)

4.2.1 Procedure

All English-speaking children were tested in English. All Portuguese-speaking children were tested both in English and Portuguese (on different days). Experimental tasks were translated into Portuguese. The Portuguese equivalent versions of standardized tests were given. Tasks were administered by English-speaking and Portuguese-speaking psychometrists and clinical graduate students. The wide-scale achievement test was given in English to all children in Ontario; data from the Grade 3 sample were used in this study.

Study 1 Examples and Coding. A few examples of children's responses to the experimental tasks were coded in the following ways:

Theory of mind (see Astington, Pelletier & Homer, 2002)
  "Mom thinks Lisa will say fruit because that's what she told her"
  "Mom thinks Lisa will say fruit because Mom doesn't know that Lisa saw the ice cream and now Lisa knows what it is"
  Score 1/0 for correct/incorrect responses (3 control + 1 first order)
  Score of 0-5 for second order
  Maximum score of 18 (for both stories)

English/Portuguese fables task (Pelletier & Beatty, 2004)
  "If you trick a person, don't expect not to be tricked back" (E)/ "If you do something to someone, then they will do it back" (P)
  "Never give food to strangers" (P)/ "Never take food from strangers" (E)
  Score of 1/0 for correct/incorrect responses (Q 1-3 facts)
  Score of 0-5 for moral of story

Maximum score of 16 for both fables

Metacognitive Language Task (Astington & Pelletier, 2004) (example, modified for older children)

> "John goes to school. There is a new kid in class. John says, 'Hi, what's your name?' The kid says his name is Daniel. John and Daniel play together. When John gets home, he says to his dad, 'There was a new kid in my class today.' Dad asks, 'What's his name?' John says, 'Er…D…D…' John couldn't tell Dad the new kid's name. Tell me, does John conclude what the new kid's name is, or does John forget what the new kid's name is?'
> Score of 1/-1 for correct/incorrect (x 12)

4.2.2   Results
Comparison of Means

Across all measures in both language groups, there were few differences in means when all children were included in the comparison. However, not surprisingly, Portuguese-speaking children scored significantly lower on the English vocabulary test. Overall in both language groups, high-achieving (levels 3/4) children were similar to each other and low-achieving (levels 1/2) children were similar to each other. For example, there was a significant difference between high- and low-achieving groups in performance on theory of mind and fables ($p<.005$) but no difference between language groups (see Figures 1 and 2). The exception to this finding was that low-achieving Portuguese speaking children performed somewhat lower on English reading skill and reading comprehension subtests than did low-achieving English speaking children. This suggests that differences for second language learners are more pronounced for lower-achieving but not higher-achieving students.
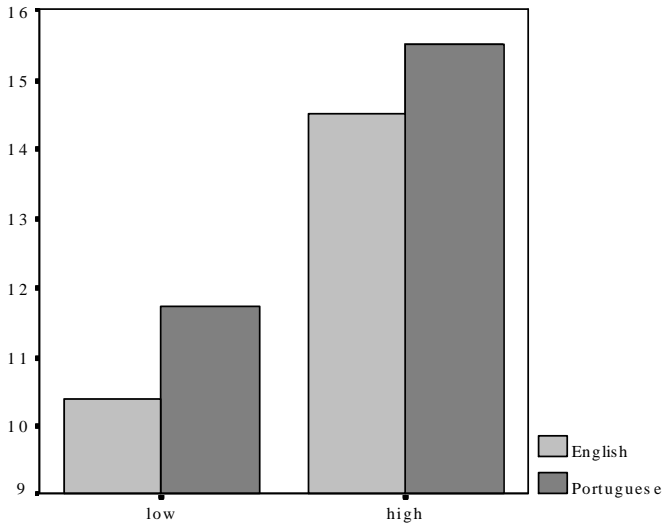
Wide Scale Reading Achievement Level

Figure 1. Low- and high-achievement groups and theory of mind scores
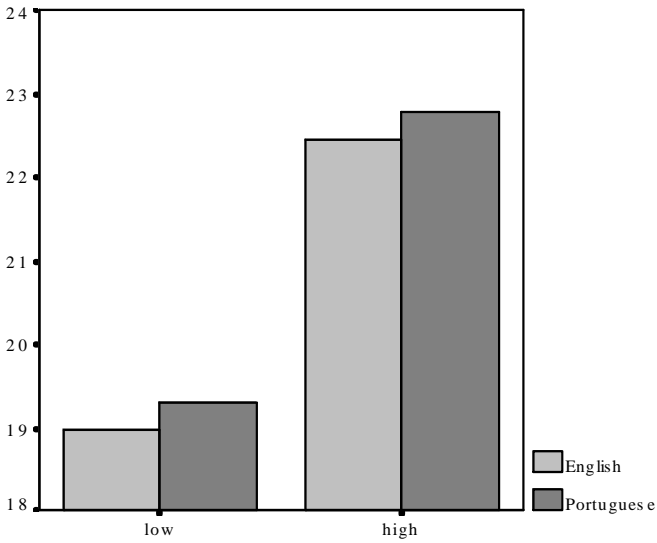
Wide Scale Reading Achievement Level

Figure 2. Low and high achievement levels and fables task performance

Correlations

For Portuguese-speaking children who were tested in both languages, paired samples correlations showed significant relations between their Portuguese decoding and English decoding skills ($r=.82$, $p<.001$); their Portuguese theory of mind and English theory of mind ($r=.33$, $p<.05$); their Portuguese fables and English fables ($r=.59$, $p<.001$), but not Portuguese vocabulary and English vocabulary. On the English measures alone there were significant relations between English decoding skills and Metacognitive Language Task performance ($r=.52$, $p<.001$); between English decoding skills and fables task performance ($r=.38$, $p<.001$); between English skills and theory of mind ($r=.27$, $p<.05$).

Analyses of Variance

English theory of mind and metacognitive language scores were summed to give a total "metacognitive" score. This variable was then re-coded by way of a median split into high and low performance groups. Children's general vocabulary was also re-coded by a median split to make high and low language groups. Given the research showing the importance of general language ability to theory of mind and metacognitive language development (e.g. Astington & Jenkins, 1999), analyses of the contribution of metacognitive factors to story comprehension was carried out for the low language group, to control for the effects of general language development. Group analyses showed that for the low-language children, metacognitive factors were more important in overall reading ability (Reading) and story comprehension (Fables) than for high language children. Specifically within the low language group, children who were in the higher metacognitive group performed significantly better on both the standardized reading comprehension task and on the fables task. See Figures 3 and 4.
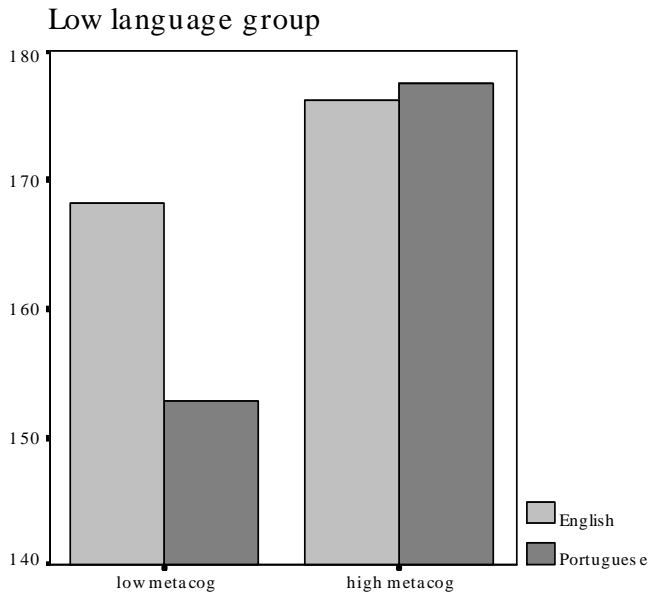
Low language group

Figure 3. Reading scores for low and high metacognitive groups in low language children.
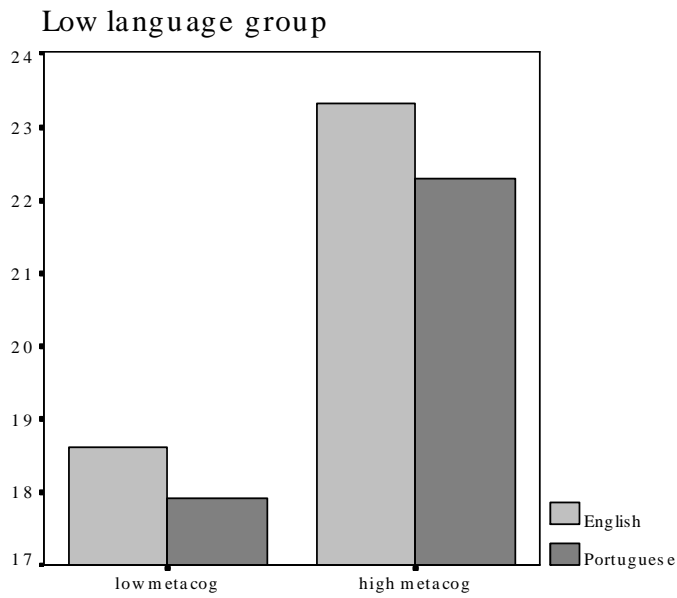
Low language group

Figure 4. Fables scores for low and high metacognitive groups in low language children.

Regressions

What predicted fables task performance for L1 and L2 children? A stepwise regression on fables task performance with vocabulary, standardized reading (WRMT), theory of mind and metacognitive language as the independent variables showed that across all children, only English vocabulary (PPVT) predicted fables task performance (that is, the ability to make inferences). There were no differences for English and Portuguese groups in these analyses.

The next question asked what predicted performance on wide-scale provincial reading tests. A stepwise regression on the standardized reading achievement test with vocabulary, standardized reading total score on the WRMT, theory of mind and metacognitive language as the independent variables showed that across all children, only the passage comprehension subtest on the standardized reading test (WRMT) predicted performance on the wide-scale reading test (that is, contributed unique variance). This finding is not surprising as one would expect a standardized reading test to predict performance on a wide-scale achievement test.

It was then important to know what predicted performance on the standardized reading test (passage comprehension subtest). A stepwise regression on the passage comprehension score was carried out with vocabulary, metacognitive language, and theory of mind as the independent variables. Results showed that there were differences for English (L1) and Portuguese (L2) children. Specifically, for L1 learners, only vocabulary and word identification skill predicted comprehension on the standardized test. Interestingly, for L2 learners, beyond word identification skill, theory of mind and metacognitive language predicted comprehension. That is, theory of mind and metacognitive language were more salient for L2 learners in reading comprehension.

A final question in Study 1 asked what differences there would be for high- and low-achieving L2 children. Regression analyses were carried out for the L2 group alone. It was found that for low-achieving L2 children, only metacognitive language accounted for unique variance in reading comprehension. For high-achieving L2 children, only vocabulary and word identification predicted comprehension, the same pattern as in the L1 children. Thus, metacognitive language development was most salient for L2 low-achieving children.

4.3   STUDY 2

Study 2 was an extension of Study 1, carried out with younger children from Kindergarten-Grade 2 (4-7 years). The goal was to examine

whether the relation between metacognitive factors and story comprehension would continue to be more salient for L2 learners, who were also younger and were just beginning to read and understand stories. In this study, a random sample was employed, rather than a convenience sample selected according to levels. Most of same measures were employed (theory of mind, fables, metacognitive language, general vocabulary), and in Study 2, a short-term memory measure was included; the Digit Span Task from the Wechsler Intelligence Scale for Children-Revised was used for this purpose. Study 2 participants included 61 Kindergarten children (4/5 years old), 86 Grade 1 children (6 years old), and 81 Grade 2 children (7 years old). There were 73 children who spoke English as a first language, 54 who spoke Cantonese as a first language, 42 children who spoke Tagalog as a first language, and 59 who spoke Ukrainian as a first language. As in Study 1, children were drawn from schools serving a range of socioeconomic and cultural backgrounds. Most L2 children were tested in both their first language and in English; however only the results of the English language measures for L2 learners are presented here with the exception of paired L1-L2 correlations.

4.3.1   Results
Comparison of Means

Not surprisingly, significant differences were found in all measures across grade levels (see Table 1).

Table 1. Means and Standard Deviations across Measures and Grade Levels

Task	Grade	N	Mean	Std. Deviation	Minimum	Maximum
Vocab	K	59	79.37	15.23	40.00	105.00
	Gr 1	86	89.89	15.37	47.00	124.00
	Gr 2	76	104.51	17.33	61.00	153.00
	Total	221	92.11	18.80	40.00	153.00
MCL	K	110	8.02	1.92	4.00	12.00
	Gr 1	144	9.04	1.80	4.00	12.00
	Gr 2	135	9.62	1.84	2.00	12.00
	Total	389	8.95	1.95	2.00	12.00
ToM	K	110	8.91	4.79	.00	21.00
	Gr 1	144	10.51	4.69	1.00	22.00
	Gr 2	135	13.71	5.52	.00	25.00
	Total	389	11.17	5.38	.00	25.00
Fables	K	110	6.10	4.25	.00	14.00
	Gr 1	144	8.22	3.81	.00	14.00
	Gr 2	135	9.65	3.84	.00	16.00
	Total	389	8.12	4.18	.00	16.00
Dig Span	K	110	8.00	2.86	.00	14.00
	Gr 1	144	10.17	2.91	2.00	18.00
	Gr 2	135	10.77	3.17	.00	24.00
	Total	389	9.76	3.19	.00	24.00

Likewise, significant differences were found across language groups. English first language children scored higher on vocabulary and theory of mind. This is not surprising for two reasons: English first language children would be expected to understand more English vocabulary than their English second language counterparts. Second, given the strong relation between language development and theory of mind, English first language children might be expected to perform better on theory of mind tasks. Cantonese first language children scored highest on the memory task (Digit Span). Tagalog first language children scored lower on all measures. There were no gender differences in these analyses and gender was not considered further.

Table 2. Means and Standard Deviations across Measures and Language Groups

Task	Language	N	Mean	Std. Deviation	Minimum	Maximum
Vocab Eng 1	English	73	97.30	18.15	60.0	141.0
	Cantonese	47	89.21	19.38	53.0	129.0
	Tagalog	42	86.28	19.20	40.0	120.0
	Ukranian	59	92.15	17.54	48.0	153.0
	Total	221	92.11	18.80	40.0	153.0
Vocab L2	English	0	.	.	.	.
	Cantonese	60	8.18	2.38	2.0	12.0
	Tagalog	47	.57	1.19	.0	5.0
	Ukranian	60	9.85	2.28	4.0	14.0
	Total	167	6.64	4.38	.0	14.0
Digit Span	English	73	6.71	1.58	3.0	11.0
	Cantonese	107	8.12	1.95	4.0	12.0
	Tagalog	90	5.16	2.07	.0	10.0
	Ukranian	119	6.52	1.85	.0	12.0
	Total	389	6.68	2.15	.0	12.0
Megacoglang	English	73	9.61	1.63	6.0	12.0
	Cantonese	107	9.03	1.84	4.0	12.0
	Tagalog	90	7.83	2.06	2.0	12.0
	Ukranian	119	9.32	1.79	4.0	12.0
	Total	389	8.95	1.95	2.0	12.0
Tom 1st Order	English	73	5.19	1.07	2.0	6.0
	Cantonese	107	5.11	.97	2.0	6.0
	Tagalog	90	3.94	1.74	.0	6.0
	Ukranian	119	5.41	.84	3.0	6.0
	Total	389	4.94	1.30	.0	6.0
Tom 2nd Order	English	73	4.15	2.06	.0	8.0
	Cantonese	107	3.57	2.18	.0	9.0
	Tagalog	90	1.73	1.95	.0	7.0
	Ukranian	119	3.73	2.03	.0	8.0
	Total	389	3.30	2.23	.0	9.0
Tom 3rd Order	English	73	3.75	3.34	.0	11.0
	Cantonese	107	3.36	3.01	.0	12.0
	Tagalog	90	1.18	2.16	.0	10.0
	Ukranian	119	3.31	2.77	.0	11.0
	Total	389	2.92	2.98	.0	12.0

Correlations

Across all groups, children's performance on the vocabulary test was related to performance on all other measures. Furthermore, performance on the Metacognitive Language Task was related to performance on all other measures, especially on theory of mind and fables. Theory of mind performance was related to performance on the fables task (r=.49, p<.001). On this experimental measure that was directly translated into Cantonese, Tagalog and Ukrainian, it appears from initial analyses that children who performed well in theory of mind in their first language, also performed well in English. This pattern held for children's performance in the fables. Specifically, English fables task understanding was related to fables understanding in Cantonese, Tagalog, and Ukrainian.

Regressions

Hierarchical stepwise regressions of the English language measures showed that children's theory of mind performance was predicted by vocabulary development. That is, children who performed well on the vocabulary test likewise had higher theory of mind development. This result supports previous findings that general language ability may precede or predict theory of mind understanding (Astington & Jenkins, 1999). The next regression analysis showed that vocabulary, metacognitive language and theory of mind scores each independently predicted children's performance on the fables task. Interestingly for each of the L2 groups (Cantonese, Tagalog and Ukrainian), fables task performance was predicted by metacognitive language development. That is, metacognitive language was more salient in L2 children's ability to understand the deeper meaning of the fables than it was for L1 children. Digit span, the measure of memory ability, made no contribution to fables task understanding.

4.4   SUMMARY AND CONCLUSIONS

These two studies examined the relations among theory of mind, metacognitive language, reading skills, and higher order story comprehension in L1 and L2 learners. Study 1 examined these relations among Grade 4 children who spoke either English or Portuguese as a first language. Study 2 examined these relations among Kindergarten – Grade 2 children who spoke either English, Cantonese, Tagalog or Ukrainian as a first language. There was a clear pattern that emerged from both studies. General vocabulary development contributed most to reading comprehension and fables understanding for L1 children and high-achieving

L2 children. That is vocabulary, more than any other factor, predicted how well L1 and high-achieving L2 learners would do on the reading and story comprehension tasks. However, the metacognitive factors of theory of mind and metacognitive language contributed more to reading and story comprehension for lower-achieving L2 children in Grade 4 and for lower-language L2 children in Kindergarten – Grade 2. It is noteworthy that children in these studies were deemed to be L2 learners, and not bilingual children. This is important to keep in mind, as effects of bilingualism have actually been associated with increased cognitive performance in general and with theory of mind in particular (Bialystok, 1988; Goetz, 2003). Nevertheless more detailed analyses of the L2 children's English language capabilities may show further interaction effects between metacognitive factors and reading.

The results of these studies point to the need for educators to consider the differential needs of first and second language learners as well as higher and lower achieving children, a need that has been raised previously regarding vocabulary and metalinguistic development of L2 learners (Carlisle, Beeman, Davis & Spharm, 1999). Children's achievement may also be related to family background which has been shown to be associated with children's theory of mind development (Cutting & Dunn, 1999). Most studies make recommendations for educational practice based on age, grade and special needs status. However, within normative populations of children, being somewhat higher or lower achieving or speaking a first or second language in school can make a difference in skills that are most important for learning, in this case, reading and story understanding. General vocabulary is important for children's reading achievement among English first language learners and among high-achieving first and second language learners. This suggests the need to provide explicit vocabulary training from an early age as some researchers are showing (e.g. Biemiller, 1998). Although metacognitive factors such as theory of mind and metacognitive language are also important in L1, they are less salient than general vocabulary. However, for second language learners, particularly lower achieving L2 children, metacognitive language and theory of mind are important in children's comprehension and inferencing ability; that is, they make unique contribution to children's understanding. This finding suggests the importance of targeting theory of mind and metacognitive language instruction for L2 learners, particularly those who are struggling in reading. Understanding the specific needs of both L1 and L2 learners in reading will help educators to tailor their instructional practices.

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