European Journal of Psychology of Education
2006, Vol. XXI, nº 4, 439-451

Metacognitive strategies and reading comprehension in elementary-school students

Svjetlana Kolić-Vehovec
Igor Bajšanski
University of Rijeka, Croatia

The aim of this study was to explore comprehension monitoring and perceived use of reading strategies as factors of reading comprehension. Participants were elementary school students from the fifth to the eighth grade. Error correction and text sensitivity tasks from the Metacomprehension test (Pazzaglia, De Beni, & Cristante, 1994), and the cloze-task were used as measures of comprehension monitoring during reading. A Strategic reading questionnaire (Kolić-Vehovec & Bajšanski, 2001b) was applied as a measure of perceived use of strategies during reading. Girls had better results than boys on text comprehension, all measures of comprehension monitoring, as well as on the Strategic reading questionnaire. Significant developmental improvements in comprehension monitoring occurred after the fifth grade and between the sixth and the eighth grade. A similar change was evident in reading comprehension. All measures of comprehension monitoring were significantly related to text comprehension in all age groups. However, perceived use of reading strategies was significantly related to reading comprehension only in eighth-grade students.

Reading comprehension is a complex task that depends on many different automatic and strategic cognitive processes (Cain, Oakhill, & Bryant, 2004). Besides automatized basic reading processes (e.g., word identification), skilled reading also requires the ongoing monitoring of comprehension, and regulation according to the goals of reading accomplished by the use of reading strategies (Alexander & Jetton, 2000; Auerbach & Paxton, 1997; Baker & Brown, 1984; Carrell, Pharis, & Liberto, 1989). Paris, Wasik, and Turner (1996) describe reading strategies as "tactics that readers use to engage and comprehend text" (p. 610). These strategies are cognitive tools that can be used deliberately, selectively and flexibly.

Comprehension monitoring is an aspect of metacognition, and Wagoner (1983) defined it as "an executive function, essential for competent reading, which directs reader's cognitive process as he/she strives to make sense of incoming information" (p. 328). Measures of comprehension monitoring usually assess a reader's ability to detect inconsistencies in text, such as scrambled sentences, contradictory sentences, or statements that conflict with external information (world knowledge). These error detection tasks require readers to evaluate their

understanding of the text and to regulate their reading to resolve any reading problems and to facilitate their understanding (Cain et al., 2004). Comprehension monitoring is important for the regulation of reading that is manifested in the way how readers plan, monitor, evaluate, and use information available to them as they make sense of what they read.

Many studies showed that readers and listeners often fail to detect inconsistencies during story comprehension. Markman (1977, 1979) showed that young children failed to detect inconsistencies as they listened to stories, and they realized their lack of understanding only when they tried to explain the story. Many studies made after Markman's study confirmed these results, and also found differences in error detection between good and poor readers (August, Flavell, & Clift, 1984; Garner, 1980; Winograd & Johnston, 1982). In Anderson and Beal's (1995) study children reported that the inconsistent paragraphs were harder to understand than the clear paragraphs, but they rarely specified the target problem, and they also rarely made inferences or guesses about the meaning of inconsistent paragraphs.

Children often fail to detect inconsistencies in text passages, even after being warned directly to look for such inconsistencies (August et al., 1984; Beal, 1990; Elliot-Faust & Pressley, 1986; Markman, 1979; Garner & Reis, 1981). In spite of the low level of error detection, younger readers generally overestimate the level of their understanding of text passages (Anderson & Beal, 1995; Zabrucky & Ratner, 1986). Baker (1979) found that even undergraduate students manifested low level of error detection after reading paragraphs containing inconsistent information.

In addition to the differences in comprehension monitoring consistently found between good and poor readers (Garner & Kraus, 1982; Grabe & Mann, 1984; Paris & Myers, 1981), there is also a positive developmental trend in comprehension monitoring during elementary school (Baker, 1984; Garner & Tylor, 1982; Kolić-Vehovec & Bajšanski, 2001a; Pazzaglia, De Beni, & Caccio, 1999). However, Markman (1979) found no grade effect on comprehension monitoring between the third and the fifth grade.

Several studies found developmental improvement in comprehension monitoring during elementary school. Pazzaglia et al. (1999) investigated the relationship between metacognition and reading comprehension on a sample of children from 8 to 13 years. Comprehension monitoring showed a positive developmental trend. Kolić-Vehovec and Bajšanski (in press) in their study on a sample of higher-elementary and high school students also found significant improvements in comprehension monitoring between fifth- and eighth-grade elementary school students and third-grade high school students. The results of these studies indicate that higher elementary school is a critical period for the development of comprehension monitoring.

Evaluating one's comprehension is essential for effective studying (Paris et al., 1996). By high school, students who report that they periodically assess their degree of understanding, and who implement strategies to enhance learning, have been found to be high academic achievers, relative to other students (Otero & Campanario, 1992; Zimmerman & Pons, 1986).

According to Walczyk's (1990) view of the development of the reading skill, beyond the threshold, perhaps after the third grade, gains in basic reading efficiency do not entail corresponding gains in higher level aspects of comprehension. By fourth grade, basic reading efficiency, though important in local text processing, may need to exceed only a minimal level for many readers in order for strategic behaviour to proceed. Changes in comprehension monitoring and in the use of reading strategies are aspects of metacognitive development which begins with young children's awareness of mental functions, and eventuates in complex metacognitive abilities which many adults do not master (Kuhn, 2000). During development, metacognition becomes more explicit, powerful, and effective, and it comes to operate increasingly under the individual's conscious control.

Developing readers may acquire knowledge about various reading strategies, which can be used for the accomplishment of specific reading goals. However, an important question is: do most children understand the need to strategically process information in order to understand text? Strategic reading reflects metacognition and motivation because readers need to know the strategies and to be willing to use them. Kolić-Vehovec and Bajšanski (2001b)

developed a self-report measure to examine readers' awareness of their own cognitive processes i.e., perception of the use of reading strategies during reading. It was found that readers, who perceived that they used reading strategies more frequently, understood text better (Kolić-Vehovec & Bajšanski, in press). The correlation between the perceived use of reading strategies and reading comprehension increases during higher elementary school and high school.

Similar results were obtained by Mokhtari and Reichard (2002), who also developed a self-report measure of perceived use of reading strategies. They found that the readers who rate their reading ability as excellent perceive that they use reading strategies more often than the readers who rate their reading ability as average or not so good.

The low level of inconsistency detection in previously mentioned studies was partially attributed to the error detection task itself because children may feel somewhat uncomfortable to admit to the interviewer that they have not understand the passage. Therefore, researchers investigated multiple measures of students' ability to monitor their comprehension (Anderson & Beal, 1995; Beal, 1990; Garner, Hare, Alexander, Haynes, & Winograd, 1984; Garner & Reis, 1981). They found some evidence that children discriminated between the clear and the inconsistent paragraphs, but children still overestimated how well they understood the text. Explicit instruction to correct the errors in a sentence or paragraph could lead to more valid data about comprehension monitoring than self-reports about passage comprehension. Therefore, in this study we applied several different error correction tasks from the Metacomprehension test (Pazzaglia, De Beni, & Cristante, 1994). We also applied text sensitivity tasks from the same test that required children to rate the relative importance of parts of the text and to identify important elements versus trivia. The third measure of comprehension monitoring in our study was the cloze task that is usually used as a measure of comprehension monitoring (Baker & Brown, 1984). In a cloze task, subjects are asked to fill in missing words in a text. This task requires searching the subsequent text for the clarification and adequacy of words filled.

Since the ability to monitor their comprehension is not enough guarantee that children actually use reading strategies, we applied the Strategic reading questionnaire (Kolić-Vehovec & Bajšanski, 2001b) as a measure of the use of reading strategies. As a result, we used measures of comprehension monitoring ability as well as a self-report measure of reading strategy use as predictors of reading comprehension.

The first aim of this study was to explore developmental differences in comprehension monitoring, the perceived use of reading strategies and reading comprehension in elementary school students from the fifth to the eighth grade. The second aim was to explore the effects of both – comprehension monitoring and perceived use of reading strategies as predictors of reading comprehension in higher elementary school.

Method

Participants

The participants in the study were students (N=526) from the fifth to the eighth grade (aged 11 to 14) in three elementary schools in Rijeka, Croatia: 122 fifth-graders (57 girls and 65 boys), 145 sixth-graders (75 girls and 70 boys), 129 seventh-graders (69 girls and 60 boys), and 130 eighth-graders (73 girls and 57 boys).

Measures

Reading comprehension was assessed on a 750 word narrative passage appropriate for the students in higher elementary school. All children were given the same passage to read. The passage was followed by 11 open-ended questions. A fully correct response on each question

scored 2 points and a partially correct one scored 1 point. The maximum score on this task was 22.

Comprehension monitoring was assessed by the monitoring questions from the Metacomprehension test and a cloze-task. The Croatian version of the *Metacomprehension test* (MT, Pazzaglia et al., 1994) originally constructed in Italian was applied. The 10 monitoring items from the Metacomprehension test required the procedural knowledge of monitoring strategies. Four items examined students' ability to detect and correct the semantic and syntactic errors in the sentences. Each item consisted of one correct sentence and four sentences with one error. Each correction was scored one point. Six items examined text sensitivity i.e., text level comprehension monitoring. The first item required students to correct wrong punctuation in a short passage (max. 3 points). The second item required students to separate sentences from two stories that were merged into one passage (max. 3 points). The third item required rating the importance of the sentences in the passage (max. 2 points). The fourth item required students to find two irrelevant sentences in the passage (max. 1 point). The fifth item required students to rate the correctness of four inferences based on the proposed title (max. 4 points). The sixth item required students to compare three pairs of sentences regarding their relevance for the comprehension of a previously read story (max. 3 points). A principal-components factor analysis of MT with an oblimin rotation yielded a two-factor solution that explained 41% of the total variance. The first factor was named *Error correction* and contained 4 items referring to syntax, spelling and meaning errors. The second factor named *Text sensitivity* contained 6 items. The items from these factors were used to form two scales. The maximum score on the Error correction scale was 16, as on the Text sensitivity scale. Cronbach's alpha reliability coefficients for the Error correction scale were between .67 and .88 for different grade-levels, and for the Comprehension monitoring scale were between .64 and .75 for different grade-levels.

In the text for the *cloze task*, 16 words were missing. The children were required to fill in blank spaces with single words. Children's cloze responses were scored according to the following procedure: (a) responses that were both semantically and syntactically appropriate to the missing word were awarded 2 points; (b) responses that were semantically but not syntactically correct were awarded one point; (c) blanks and responses that were semantically inappropriate were awarded no points. The maximal possible result on this task was 32 points.

The perceived use of reading strategies was assessed by the *Strategic reading questionnaire* (SRQ, Kolić-Vehovec & Bajšanski, 2001b) that consists of 31 items. All the items refer to statements about the use of different reading strategies, including various aspects of active comprehension and comprehension monitoring during reading. The SRQ has three subscales: *Active comprehension strategies* (16 items; e.g., "Before reading, I read the title and try to figure out what the story is about."), *Comprehension monitoring* (9 items; e.g., "After reading, I try to assess if I understand what I have read."), and *Inference generation* (6 items; e.g., "During reading, I try to figure out what will happen next."). Cronbach's alpha reliability coefficients for the subscales were .88, .80, and .80, respectively. The participants were asked to rate how often they use different reading strategies on a 5-point Likert type scale, ranging from 1 (never) to 5 (always). The score on each subscale was computed as total of item ratings.

Procedure

All the tasks were administered to the children in their classrooms as intact groups. The data collection included two parts. In the first part, the Metacomprehension test was administered during one school hour. The second part of the data collection took place within one week after the first part. The Reading comprehension task, Cloze-task and SRQ were administered during one school hour. The tasks were not time constrained.

Results

Means and standard deviations for boys and girls from the fifth to the eight grades on text comprehension, comprehension monitoring and perceived use of reading strategies are presented in Table 1. Differences in text comprehension, comprehension monitoring and perceived use of reading strategies between girls and boys in different grades were tested by two-way ANOVAs. All post-hoc comparisons were made with the Newman-Keuls test, and an alpha level of .05 was used for all post-hoc tests. Girls had better results than boys on all dependent variables: text comprehension, $F(1,406)=16.29$, MSE=8.11, $p<.001$, $\eta^2=0.04$, Error correction (MT), $F(1,433)=21.69$, MSE=9.99, $p<.001$, $\eta^2=0.05$, Text sensitivity (MT), $F(1,421)=37.74$, MSE=8.44, $p<.001$, $\eta^2=0.08$, cloze task, $F(1,471)=32.37$, MSE=32.21, $p<.001$, $\eta^2=0.06$, as well as on Active comprehension strategies (SRQ), $F(1,455)=6.93$, MSE=176.31, $p<.01$, $\eta^2=0.02$, Comprehension monitoring (SRQ), $F(1,457)=8.56$, MSE=59.47, $p<.01$, $\eta^2=0.02$, and Inference generation (SRQ), $F(1,453)=9.93$, MSE=29.41, $p<.01$, $\eta^2=0.02$.

Significant grade effect was found for text comprehension, $F(3,406)=5.70$, MSE=8.11, $p<.001$, $\eta^2=0.04$. A post-hoc comparison with the Newman-Keuls test showed better reading comprehension in the sixth-grade than in the fifth-grade students, and in the eighth-grade than in the sixth-grade students. For Error correction (MT) grade effect was not significant, $F(3,433)=2.10$, MSE=9.99, $p>.05$. However, post-hoc comparison showed that eighth-graders had better results than fifth-graders. Grade effect was also non-significant for Text sensitivity (MT), $F(3,421)=1.93$, MSE=8.44, $p>.05$, but post-hoc analysis showed some significant differences, as for error correction: the seventh- and the eighth-grade students had better results than the fifth-grade students. Significant grade effect was found for the cloze task, $F(3,471)=23.83$, MSE=32.21, $p<.001$, $\eta^2=0.13$: sixth graders had better results than fifth graders, and seventh graders had better results than sixth graders.

Grade differences in perceived use of reading strategies were obtained for Active comprehension strategies (SRQ), $F(3,455)=3.17$, MSE=176.31, $p<.05$, $\eta^2=0.02$, and for Comprehension monitoring (SRQ), $F(3,457)=3.67$, MSE=59.47, $p<.05$, $\eta^2=0.02$. Students in the eighth grade perceived that they used strategies less than students in the fifth grade. For the Inference generation subscale of SRQ grade differences were not significant, $F(3,453)=0.29$, MSE=29.41, $p>.05$.

The interaction effects between gender and grade were not significant for any dependent variable: text comprehension, $F(3,400)=0.48$, MSE=8.11, $p>.05$, Error correction (MT), $F(3,433)=2.15$, MSE=9.99, $p>.05$, Text sensitivity (MT), $F(3,421)=1.84$, MSE=8.44, $p>.05$, Cloze task, $F(3,471)=0.75$, MSE=32.21, $p>.05$, Active comprehension strategies (SRQ) $F(3,455)=1.57$, MSE=176.31, $p>.05$, Comprehension monitoring (SRQ), $F(3,457)=0.19$, MSE=59.47, $p>.05$, Inference generation (SRQ), $F(3,453)=1.03$, MSE=29.41, $p>.05$.

The correlations between text comprehension, measures of comprehension monitoring and perceived use of reading strategies for each grade level are shown in Table 2. Two subscales from the MT were moderately correlated in all grades. The cloze task was also moderately related to both subscales from the MT from the fifth to the seventh grade, but not in the eighth grade. Subscales from the SRQ were highly correlated in all grades. However, the inference generation subscale had a somewhat lower correlation with the comprehension monitoring subscale in all grades, compared to other correlations between subscales of the SRQ. Measures of comprehension monitoring did not significantly correlate with perceived use of reading strategies in the fifth and the sixth grades. One exception is a significant correlation between the Inference generation subscale (SRQ) and Text sensitivity (MT) in the fifth grade. In the seventh grade only Error correction (MT) was significantly correlated with the Active comprehension subscale (SRQ) and Comprehension monitoring subscale (SRQ). Only in the eighth grade were all measures of comprehension monitoring moderately correlated with perceived use of reading strategies. The Active comprehension subscale (SRQ) and Inference generation subscale (SRQ) were significantly correlated with all three measures of comprehension monitoring. The Comprehension monitoring subscale (SRQ) was correlated only with text sensitivity (MT). Subscales from the Metacomprehension test and cloze task were moderately correlated with text

comprehension in all grades. Subscales from the SRQ were not significantly correlated with text comprehension until the eighth grade. The Active comprehension subscale and inference generation subscale were moderately correlated with text comprehension.

Table 1

Means and standard deviations of the text comprehension, tasks of Metacomprehension test, cloze task, and subscales of SRQ for girls and boys in different grades

	Text comprehension					
	Girls			Boys		
Grade	Mean	St. dev.	*n*	Mean	St. dev.	*n*
5th	11.18	2.77	44	9.95	2.96	44
6th	11.63	3.29	67	11.05	2.53	61
7th	12.50	2.41	58	10.90	3.33	42
8th	12.90	2.88	62	11.67	2.47	36
	Error correction (MT)					
	Girls			Boys		
Grade	Mean	St. dev.	*n*	Mean	St. dev.	*n*
5th	11.23	2.66	47	10.21	3.35	56
6th	11.51	3.04	68	11.11	2.85	62
7th	12.35	3.18	62	10.07	3.45	45
8th	12.83	2.62	60	10.85	4.26	41
	Text sensitivity (MT)					
	Girls			Boys		
Grade	Mean	St. dev.	*n*	Mean	St. dev.	*n*
5th	11.76	2.20	45	10.16	3.61	52
6th	12.10	2.49	68	11.31	2.91	62
7th	13.06	2.02	62	10.72	2.91	43
8th	12.62	2.81	59	10.30	4.39	38
	Cloze task					
	Girls			Boys		
Grade	Mean	St. dev.	*n*	Mean	St. dev.	*n*
5th	16.25	6.54	55	12.53	6.46	64
6th	16.64	4.72	72	14.89	5.05	66
7th	20.55	5.04	60	17.18	5.92	49
8th	21.45	5.35	67	18.35	6.53	46
	Active comprehension (SRQ)					
	Girls			Boys		
Grade	Mean	St. dev.	*n*	Mean	St. dev.	*n*
5th	54.56	11.21	52	48.65	11.95	60
6th	49.18	14.66	65	49.87	14.40	63
7th	49.63	13.66	59	47.14	12.78	51
8th	48.91	12.94	67	43.52	13.93	46
	Comprehension monitoring (SRQ)					
	Girls			Boys		
Grade	Mean	St. dev.	*n*	Mean	St. dev.	*n*
5th	31.77	7.03	52	30.22	7.74	60
6th	30.95	7.75	65	29.38	8.25	63
7th	31.42	7.97	59	28.69	8.07	52
8th	29.01	6.64	68	26.43	8.28	46
	Inference generation (SRQ)					
	Girls			Boys		
Grade	Mean	St. dev.	*n*	Mean	St. dev.	*n*
5th	22.33	5.00	52	20.83	5.28	59
6th	21.54	5.87	68	21.31	5.49	62
7th	23.14	3.98	59	20.66	5.70	50
8th	22.35	5.40	66	20.13	6.53	45

Table 2

Correlations of the text comprehension, comprehension monitoring tasks and SRQ in the fifth, the sixth, the seventh and the eighth grade

Measures	1.	2.	3.	4.	5.	6.
5th grade (*n*=80)						
1. Text comprehension	1					
2. Error correction (MT)	.40**	1				
3. Text sensitivity (MT)	.30**	.27**	1			
4. Cloze task	.36**	.37**	.40**	1		
5. Active comprehension (SRQ)	.05	-.01	.15	.08	1	
6. Comprehension monitoring (SRQ)	-.02	.06	.09	.03	.77**	1
7. Inference generation (SRQ)	.12	.03	.24*	.06	.57**	.47**
6th grade (*n*=106)						
1. Text comprehension	1					
2. Error correction (MT)	.33**	1				
3. Text sensitivity (MT)	.36**	.45**	1			
4. Cloze task	.26**	.35**	.27**	1		
5. Active comprehension (SRQ)	-.07	-.07	-.16	-.02	1	
6. Comprehension monitoring (SRQ)	-.01	-.06	-.07	-.03	.78**	1
7. Inference generation (SRQ)	.01	-.05	.05	.14	.75**	.57**
7th grade (*n*=84)						
1. Text comprehension	1					
2. Error correction (MT)	.26**	1				
3. Text sensitivity (MT)	.37**	.37**	1			
4. Cloze task	.31**	.30**	.25*	1		
5. Active comprehension (SRQ)	.06	.29**	.02	.04	1	
6. Comprehension monitoring (SRQ)	-.02	.23*	.06	.02	.76**	1
7. Inference generation (SRQ)	.10	.14	.12	.20	.57**	.51**
8th grade (*n*=80)						
1. Text comprehension	1					
2. Error correction (MT)	.39**	1				
3. Text sensitivity (MT)	.26*	.27**	1			
4. Cloze task	.50**	.11	.10	1		
5. Active comprehension (SRQ)	.22*	.22*	.24**	.28**	1	
6. Comprehension monitoring (SRQ)	.11	.12	.23*	.18	.75**	1
7. Inference generation (SRQ)	.28**	.23*	.29**	.34**	.63**	.50**

Note. *$p<.05$;**$p<.01$.

In order to have some further insights into the effects of different measures of comprehension monitoring and perceived use of reading strategies on text comprehension over and above gender and grade effects, a hierarchical multiple regression analysis was performed (Table 3). In step one, gender and grade were included as predictors in the regression analysis in order to control their effects in further steps. Both gender and grade were significant predictors, and explained 10% of the variance of reading comprehension. In step two, measures of comprehension monitoring – Error correction (MT), Text sensitivity (MT) and the cloze task were included in the analysis. A significant change in multiple R^2 was obtained. In addition to the effect of grade, all three measures of comprehension monitoring were significant predictors of text comprehension. All predictors together explained 27% of variance of reading comprehension. However, gender was not a significant predictor in the second model, due to the correlation between gender and comprehension monitoring. Finally, in step three, measures of perceived use of reading strategies were included in analysis. There was no significant change in multiple R^2 in the third model. Perceived use of reading strategies did not significantly contribute to reading comprehension over and above the effect of grade and comprehension monitoring.

Table 3

Summary of the hierarchical regression analysis of the variables predicting text comprehension

	β	R	F	R^2	R^2 Change	*F* Change
Step 1		.31	18.1***	.10		
Gender	-.19***					
Grade	.22***					
Step 2		.52	24.86***	.27	.17	26.68***
Error correction	.20***					
Text sensitivity	.18***					
Cloze task	.25***					
Step 3		.52	15.68***	.27	.00	.54

Note. ***$p<.01$.

Discussion

The results obtained in this study showed developmental improvements of comprehension monitoring during higher elementary school. Similar improvements on comprehension monitoring tasks were also found in several other studies (Kolić-Vehovec & Bajšanski, 2001a, in press; Paris et al., 1996; Pazzaglia et al., 1999). The results indicate that significant transition happens after the fifth grade, but there are more transition periods up to the eighth grade in different aspects of comprehension monitoring. The developmental effect on reading comprehension is somewhat different than the effect on comprehension monitoring. Two transitions were obtained in higher elementary school on a text comprehension task: between the fifth and the sixth grade, and between the sixth and the eighth grade. However, these differences were relatively small, but similar to the results of our previous study (Kolić-Vehovec & Bajšanski, 2001a, in press) that showed a small improvement in comprehension of narrative text during higher elementary school and further improvement during high school.

The developmental pattern varies among measures of comprehension monitoring. This is an indicator of the complexity of monitoring processing during reading and different developmental trends of different components of comprehension monitoring. Achievement on inconsistency detection and text sensitivity tasks showed a slower pace of improvement during higher elementary school compared to cloze task. A cloze task measures different aspects of metacognitive monitoring and intersentential integration. These processes gradually become automatic during higher elementary school.

The perceived use of reading strategies showed the opposite pattern of differences. Fifth-grade students' estimates of the use of reading strategies are higher than those of eighth-grade students. That is the case for strategies of active comprehension and comprehension monitoring, but there were no differences in the use of inference generation. These results demonstrate that young readers differentiate between types of reading strategies. However, measures of perceived use of reading strategies were not consistently related to comprehension monitoring until the eighth grade. One possible explanation of these results is that younger students do not accurately assess their actual reading strategy use or they use these strategies inadequately or inefficiently. Fifth grade students probably overestimate their use of reading strategies. This overestimation could be the result of inadequate metacognitive ability: in the fifth-grade various aspects of metacognitive knowledge are still developing, and the accuracy of metacognitive judgments depends on metacognitive knowledge. Another possible explanation of differences obtained is that as readers become more expert, some strategic behaviours, such as comprehension monitoring, become automatic and therefore eighth-grade students' reports of reading strategy use were lower than those reports of younger readers. More complex strategies, such as inference generation, are still conscious and controlled and therefore there were no grade differences in the perceived use of these strategies.

Higher perceived use of reading strategies in the fifth-grade compared to the eighth-grade students, could also reflect motivation, i.e., differences in the perceived value of academic success in two age groups (Bezinović, 2002; Eccles, Wigfield, Midgley, Reuman, MacIver, & Feldlanfer, 1993; Kolić-Vehovec, 2000). Because strategic processing is effortful and goal-directed, changes in motivational factors can influence strategy development (Wigfield & Eccles, 1992).

The results of this study also showed gender differences: girls had better results than boys in text comprehension, as well as in comprehension monitoring and perceived reading strategy use. This finding is in accordance with the results of our previous research (Kolić-Vehovec & Bajšanski, in press), and with the results of studies of gender differences in cognitive functioning cited by Halpern (2000). These differences are attributed to different effects, from the effects of hormones and brain anatomy to the effects of socio-cultural factors. Gender differences are also obtained in the perceived use of reading strategies: girls in all grades report that they use reading strategies more often than boys. This pattern of differences can be related to motivation, especially to gender differences in academic motivation in higher elementary and high school (Bezinović, 2002; Kolić-Vehovec, 2000). It seems that girls are more ready to actively regulate their learning and reading than boys or to report about their engagement in learning.

The correlations showed that comprehension monitoring is significantly and consistently related to reading comprehension during higher elementary school. Significant improvement in reading comprehension during that period could be at least partially attributed to improvement in the effectiveness of comprehension monitoring. That is in line with the results of the regression analysis: all measures of comprehension monitoring were significant predictors of reading comprehension over and above grade effect.

This finding is in accordance with Kuhn's (2000) claim that development entails a shifting distribution in the frequencies with which more adequate strategies are applied. If these shifts in strategy use are not also manifested in performance (i.e., reading comprehension), as was the case for younger students in our study, metacognition could be a good explanation. The metastrategic knowledge directs the application of strategies, and inadequate metastrategic knowledge will mislead strategy selection and application. However, feedback from this application is directed back to the meta-level. This feedback leads to enhanced metacognitive awareness of the goal and the extent to which it is being met by different strategies, as well as enhanced awareness and understanding of the strategies themselves. These enhancements of metastrategic knowledge lead to revised strategy selection and more effective strategy use that have better comprehension as a consequence.

Perceived use of reading strategies was significantly correlated with reading comprehension only in the eighth grade, but this correlation is still too small to be important for prediction of reading comprehension over and above comprehension monitoring. In our previous study done on the elementary and high-school students (Kolić-Vehovec & Bajšanski, in press) this correlation was higher for the high-school students (r ranged from .41 to .48) than for the eighth-grade elementary school students (r ranged from .19 to .26). This developmental trend indicates that metastrategic knowledge has a somewhat slower development than comprehension monitoring and reading comprehension. The development of metacognitive awareness requires a lot of experience with the use of different reading strategies and adequate feedback about their effectiveness obtained by comprehension monitoring. Young readers face many different complex and novel problem situations during reading, and they have to work out strategic solutions to those problems. However, their strategic behaviour is often not very efficient. Alexander, Graham, and Harris (1998) claimed that as children gain experience and become more competent in a subject, there should be both quantitative and qualitative shifts in their strategic behaviour. Strategic processing becomes more sophisticated, effective and flexible. Existing strategies are upgraded and fine-tuned, and new strategies are learned and devised. In skilled readers strategies are typically used to solve those problems that are still novel or complex enough to warrant a strategic solution. Otherwise, most of their reading processes are carried out automatically.

Kuhn (2000) stated that competence in meta-knowing warrants attention as a critical endpoint and goal of childhood and adolescent cognitive development. As our results have shown, higher elementary school is the period when significant improvement in comprehension monitoring and reading comprehension takes place. Therefore, that is the period when effective instruction in reading strategies with emphasis on comprehension monitoring should be applied and could foster metacognitive development and reading efficiency. It could help students to become self-regulated strategic readers highly competent in reading comprehension and to improve academic achievement in formal educational settings.

References

Alexander, P.A., & Jetton, T.L. (2000). Learning from text: A multidimensional and developmental perspective. In M.L. Kamil, P.B. Mosenthal, P.D. Pearson, & R. Barr (Eds.), *Handbook of reading research* (vol. 3, pp. 285-310). Mahwah, NJ: LEA.

Alexander, P.A., Graham, S., & Harris, K.R. (1998). A perspective on strategy research: Progress and prospects. *Educational Psychology Review, 10*, 129-154.

Anderson, G., & Beal, C.R. (1995). Children's recognition of inconsistencies in science texts: Multiple measures of comprehension monitoring. *Applied Cognitive Psychology, 9*, 261-272.

Auerbach, E., & Paxton, D. (1997). "It's not the English thing": Bringing reading research into the ESL classroom. *TESOL Quarterly*, *31*, 237-261.

August, D.L., Flavell, J.H., & Clift, R. (1984). Comparison of comprehension monitoring of skilled and less skilled readers. *Reading Research Quarterly, 20,* 39-53.

Baker, L. (1979). Comprehension monitoring: Identifying and coping with text confusions. *Journal of Reading Behavior, 11*, 366-374.

Baker, L. (1984). Spontaneous versus instructed use of multiple standards for evaluating comprehension: Effects of age, reading proficiency, and type of standard. *Journal of Experimental Child Psychology*, *38*, 289-311.

Baker, L., & Brown, A.L. (1984). Metacognitive skills and reading. In P.D. Pearson, M. Kamil, R. Barr, & P. Mosenthal (Eds.), *Handbook of reading research* (vol. 1, pp. 353-394). White Plains, NY: Longman.

Beal, C.R. (1990). The development of text evaluation and revision skills. *Child Development, 61,* 247-258.

Bezinović, P. (2002). *Škola iz perspektive učenika: Kako srednjoškolci vide svoju školu* [School from students' perspective: How high-school students perceive their school?]. Unpublished manuscript.

Cain, K., Oakhill, J., & Bryant, P. (2004). Children's reading comprehension ability: Concurrent prediction by working memory, verbal ability, and component skills. *Journal of Educational Psychology, 96,* 31-42.

Carrell, P., Pharis, B.G., & Liberto, J.C. (1989). Metacognitive strategy training for ESL reading. *TESOL Quarterly*, *23*, 646-678.

Eccles, J.S., Wigfield, A., Midgley, C., Reuman, D., MacIver, D., & Feldlanfer, H. (1993). Negative effects of traditional middle schools on student's motivation. *The Elementary School Journal, 5*, 553-574.

Elliot-Faust, D.J., & Pressley, M. (1986). How to teach comparison processing to increase children's short- and long-term listening comprehension monitoring. *Journal of Educational Psychology, 78,* 27-33.

Garner, R. (1980). Monitoring of understanding: An investigation of good and poor readers' awareness of induced misconceptions of text. *Journal of Reading Behavior, 12,* 55-63.

Garner, R., & Kraus, C. (1982). Good and poor comprehenders' differences in knowing and regulating reading behaviors. *Educational Research Quarterly*, *6*, 5-12.

Garner, R., & Reis, R. (1981). Monitoring and resolving comprehension obstacles: An investigation of spontaneous text lookbacks among upper-grade good and poor readers' comprehension. *Reading Research Quarterly, 16,* 569-582.

Garner, R., & Tylor, N. (1982). Monitoring and understanding: An investigation of attentional assistance needs at different grade and reading proficiency levels. *Reading Psychology, 3,* 1-6.

Garner, R., Hare, V.C., Alexander, P., Haynes, J., & Winograd, P. (1984). Inducing use of a text lookback strategy among unsuccessful readers. *American Educational Research Journal, 21,* 789-798.

Grabe, M., & Mann, S. (1984). A technique for the assessment and training of comprehension monitoring skills. *Journal of Reading Behavior*, *16*, 131-144.

Halpern, D.F. (2000). *Sex Differences in Cognitive Abilities*. Mahwah, NJ: LEA.

Kolić-Vehovec, S. (2000). *Evaluacija projekta "Kvalitetna škola"* [Evaluation of the project "Quality school"]. Unpublished manuscript.

Kolić-Vehovec, S., & Bajšanski, I. (2001a). Children's metacognition as predictor of reading comprehension at different developmental levels, *ERIC database*, 19 p., ED456422.

Kolić-Vehovec, S., & Bajšanski, I. (2001b). Konstrukcija upitnika strategijskog čitanja [Construction of Strategic Reading Questionnaire]. *Psihologijske teme*, *9*, 51-61.

Kolić-Vehovec, S., & Bajšanski, I. (in press). Dobne i spolne razlike u nekim vidovima metakognicije i razumijevanja pri čitanju [Age and gender differences in some aspects of metacognition and reading comprehension]. *Društvena istraživanja*.

Kuhn, D. (2000). Metacognitive development. *Current Directions in Psychological Science, 9,* 178-181.

Markman, E.M. (1977). Realizing that you don't understand: A preliminary investigation. *Child Development, 48,* 986-992.

Markman, E.M. (1979). Realizing you don't understand: Elementary school children's awareness of inconsistencies. *Child Development, 50,* 643-655.

Mokhtari, K., & Reichard, C.A. (2002). Assessing students' metacognitive awareness of reading strategies. *Journal of Educational Psychology*, *94*, 249-259.

Otero, J., & Campanario, J.M. (1992). The relationship between academic achievement and metacognitive comprehension monitoring ability. *Educational & Psychological Measurement, 52*(2), 419-431.

Paris, S.G., & Myers, M. (1981). Comprehension monitoring in good and poor readers. *Journal of Reading Behavior*, *13*, 5-22.

Paris, S.G., Wasik, B.A., & Turner, J.C. (1996). The development of strategic readers. In R. Barr, M.L. Kamil, P.B. Mosenthal, & P.D. Pearson (Eds.), *Handbook of Reading Research* (vol. 2, pp. 609-640). Mahwah: LEA.

Pazzaglia, F., De Beni, R., & Caccio, L. (1999). The role of working memory and metacognition in reading comprehension difficulties. In T.E. Scruggs & M.A. Mastropieri (Eds.), *Advances in learning and behavioral disabilities* (vol. 13, pp. 115-134). Greenwich, CT: JAI Press.

Pazzaglia, F., De Beni, R., & Cristante, F. (1994). *Prova di metacomprensione* [Metacomprehension test]. Firenze, Italia: Organizzazioni Speciali.

Wagoner, S.A. (1983). Comprehension monitoring: What it is and what we know about it. *Reading Research Quarterly, 28*, 328-346.

Walczyk, J.J. (1990). Relation among error detection, sentence verification, and low-level reading skills of fourth graders. *Journal of Educational Psychology, 82,* 491-497.

Wigfield, A., & Eccles, J. (1992). The development of achievement task values: A theoretical analysis. *Developmental Review, 12*, 265-310.

Winograd, P., & Johnston, P. (1982). Comprehension monitoring and error detection paradigm. *Journal of Reading Beahvior, 14,* 61-74.

Zabrucky, K., & Ratner, H.H. (1986). Children's comprehension monitoring and recall of inconsistent stories. *Child Development, 57*, 1401-419.

Zimmerman, B.J., & Pons, M.M. (1986). Development of a structured interview for assessing student use of self-regulated learning strategies. *American Educational Research Journal, 23,* 614-628.

Le but de cette étude a été d'explorer le monitorage de la compréhension et l'usage des stratégies de la lecture perçu en tant qu'éléments de la compréhension lors de la lecture. Les participants dans cette recherche étaient les élèves de la cinquième à la huitième année de l'école primaire. Comme mesures de monitorage de la compréhension lors de la lecture on a adopté les devoirs de la correction d'erreurs et les devoirs pour examiner la sensibilité envers le texte, pris du Test de la métacompréhension (Pazzaglia, De Beni, et Caccio, 1999). Le Questionnaire de la lecture stratégique (Kolić-Vehovec et Bajšanski, 2001b) a été adopté comme mesure de l'usage des stratégies perçu lors de la lecture. Les filles ont eu de meilleurs résultats que les garçons sur les tests de la compréhension du texte, sur toutes les mesures du monitorage de la compréhension ainsi que sur le Questionnaire de la lecture stratégique. Des améliorations significatives dans le monitorage de la compréhension apparaissent après la cinquième année et entre la sixième et la huitième année. Des changements similaires sont visibles aussi dans la compréhension lors de la lecture. Toutes les mesures du monitorage de la compréhension étaient reliées de manière significative avec la compréhension du texte auprès de tous les groupes de différent âge. Toutefois, l'usage des stratégies perçu était significativement relié avec la compréhension de la lecture seulement chez les élèves de la huitième année.

Key words: Comprehension monitoring, Metacognition, Reading comprehension.

Received: Juillet 2005

Revision received: January 2006

Svjetlana KoliæVehovec. University of Rijeka, Faculty of Arts and Sciences, Department of Psychology, Trg I. Klobučarića 1, 51000 Rijeka Croatia. E-mail: skolic@ffri.hr; Web site: www.ffri.hr

Current theme of research:

Self-regulated learning. Metacognition and reading. Motivation and learning strategies.

Most relevant publications in the field of Psychology of Education:

Kolić-Vehovec, S. (2002). Effects of self-monitoring training on reading accuracy and fluency of poor readers. *European Journal of Psychology of Education*, *17*, 129-138.

Kolić-Vehovec, S. (2002). Self-monitoring and attribution training with poor readers. *Studia Psychologica*, *44*, 57-68.

Kolić-Vehovec, S., & Bajšanski, I. (2003). Children's metacognition as predictor of reading comprehension at different developmental levels. *Proceedings of the 12th European Conference on Reading* (pp. 216-222). Dublin: Reading Association of Ireland.

Kolić-Vehovec, S., & Muranović, E. (2004). Evaluacija treninga recipročnog poučavanja strategija čitanja (The evaluation of the reciprocal teaching of reading strategies). *Suvremena psihologija*, *1,* 95-108.

Kolić-Vehovec, S., & Rončević, B. (2003). Perfekcionizam, ispitna anksioznost i akademsko samopoimanje darovitih gimnazijalaca (Perfectionism, test anxiety and academic self-concept in gifted high-school students). *Društvena istraživanja, 12,* 679-702.

Igor Bajšanski. University of Rijeka, Faculty of Arts and Sciences, Department of Psychology, Trg I. Klobučarića 1, 51000 Rijeka Croatia. E-mail: sibajsan@ffri.hr; Web site: www.ffri.hr

Current theme of research:

Self-regulated learning. Metacognition and reading. Motivation and learning strategies.

Most relevant publications in the field of Psychology of Education:

Kolić-Vehovec, S., & Bajšanski, I. (2001). Konstrukcija upitnika strategijskog čitanja (Construction of the Strategic Reading Questionnaire). *Psihologijske teme*, *10*, 51-62.

Kolić-Vehovec, S., & Bajšanski, I. (2003). Children's metacognition as predictor of reading comprehension at different developmental levels. *Proceedings of the 12th European Conference on Reading* (pp. 216-222). Dublin: Reading Association of Ireland.