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The Relation Between Metacognition and Depressive Symptoms in Preadolescents With Learning Disabilities: Data in Support of Borkowski's Model

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Borkowski and colleagues (Borkowski, Carr, Rellinger, & Pressley, 1990; Borkowski, Johnston, & Reid, 1986; Borkowski & Muthukrishna, 1992) proposed a model that relates behavioral patterns of children facing school tasks with strategic knowledge, self-monitoring, motivation, attributions, self-esteem, and affective responses. These researchers suggested that good cognitive performance following a strategic approach increases general strategic knowledge, self-esteem, and associated feelings. In particular, the model predicts that students with learning disabilities (LD) who are not able to experience completely the effects of a strategic approach to the task do not spontaneously develop general metacognitive skills. Furthermore, they do show inadequate attribution to effort and depressive feelings. Positive correlations between metacognitive system components and affective responses were expected. Our work aimed to verify these predictions of the model. We compared two groups of preadolescents, with and without LD. Results showed that students with LD had less effective monitoring skills, lower attributions to effort, and a wider range of depressive symptoms than did students without LD. These results and the correlations obtained between the components of the model are discussed with reference to Borkowski's model.

Metacognitive knowledge is the knowledge students have about their own cognitive processes (e.g., memory, reading comprehension). For example, metamemory knowledge is knowledge about a person's own memory processes (Flavell, 1978, 1982). Metacognitive monitoring can be defined as the monitoring students exert on their own cognitive processes (Brown, 1978; Brown, Bransford, Ferrara, & Campione, 1983).

In recent years, a number of studies have investigated the role of metacognitive knowledge and self-monitoring in learning (Borkowski, Carr, Rellinger, & Pressley, 1990; Cornoldi, 1996; Paris & Winograd, 1990; Pazzaglia, Cornoldi, & De Beni, 1995). These studies revealed deficits in metacognitive knowledge and self-monitoring among students with learning disabilities (LD). Students with LD had difficulty with self-regulation of organized strategic behavior, such as evaluating text difficulty and regulating study times (Owings, Petersen, Bransford, Morris, & Stein, 1980; Papetti, Cornoldi, Pettavino, Mazzoni, & Borkowski, 1992), identifying errors and incongruous material in text (Garner, 1987), recognizing text frames and evaluating the importance of different parts of the text, and finding clues about the text from its title (Brown et al., 1983).

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Other authors have investigated the motivational and affective deficits of students with LD, with respect to metacognitive theory. The motivational correlates of metacognition include self-esteem, theories about intelligence, and attributional beliefs. Attributional theories (Weiner, 1979) address how students explain their own successes and failures. A student can attribute failure or poor performance at school to internal factors such as ability or effort, to external factors such as luck or help, or to factors with either an internal or an external locus of control (e.g., effort and task difficulty, respectively). Children with LD often make fewer attributions to effort, particularly in situations of failure (Pearl, Bryan, & Donahue, 1980) and have fewer expectations of success following failure than do children without LD (Butkowsky & Willows, 1980). Students with LD hold pessimistic expectations about their own performance, and they frequently develop anxiety reactions.

The association between depression and learning disabilities is important and has been widely discussed in literature. Epidemiological data confirm this: Although learning disabilities are present in over half of children with depression, an associated depressive disorder is also found in about half of students with LD (Brumback, Jackoway, & Weinberg, 1980; Brumback & Staton, 1983; Colbert, Newman, Ney, & Young, 1982; Heath, 1995, Huntington & Bender, 1993; Mouren & Dugas, 1982; Wright-Strawderman & Watson, 1992). However, the relation between depressive feelings and

metacognitive knowledge has not been adequately investigated, especially with students with LD.

BORKOWSKI'S INTEGRATED MODEL

Borkowski and colleagues (Borkowski et al., 1990; Borkowski & Muthukrishna, 1992) have proposed a model that relates behavioral patterns of children facing school tasks, specific strategic knowledge and self-regulation, motivation, attributional beliefs, self-esteem, and affective responses. They conceptualized metacognition in terms of interactive and mutually related, closely linked components.

One component of this model is specific strategy knowledge—that is, knowledge about the appropriate strategies for a given task, when to use these strategies, and how to apply them efficiently (Borkowski et al., 1990). An increase in specific strategy knowledge improves the efficiency of online regulation and monitoring of strategies. The student is eventually able to verify the strategies applied in performing a particular task.

The development of strategic and self-regulated processes helps the student to recognize the importance of being strategic. Feelings of self-efficacy emerge (Borkowski, 1992), and the student learns to attribute academic successes to effort rather than to external factors. When students begin to enjoy learning and realizes that competence improves through their own efforts, students develop an internal locus of control, attribute successes and failures to effort, and experience feelings of self-efficacy.

The sense of self-efficacy and enjoyment in learning derives from and, at the same time, strengthens self-regulated and strategic behavior. This causal and bidirectional link between self-regulation and the self-esteem system represents the uniqueness of this model (Borkowski, 1996; Borkowski & Muthukrishna, 1992). Moreover, several investigations highlighted how the introduction of motivational training in strategic learning programs fosters the use and transfer of learned strategies (Borkowski et al., 1990; Borkowski, Johnston, & Reid, 1986; Borkowski & Muthukrishna, 1992). Children receiving both strategic and motivational training were better at generalizing learned strategies than either children receiving strategic training only or a control group receiving neither strategic nor motivational training.

According to Borkowski's model, the development of an adequate metacognitive system in populations with LD is delayed, particularly when there has been no intervention directed at the metacognitive system. If strategic and self-regulated processes are not adequately developed, children will experience repeated failures with cognitive tasks as a consequence. It follows, then, that depressive symptoms will appear and only a very low level of self-efficacy will be reached.

The main predictions of Borkowski's model are the following:

- Metacognitive knowledge and self-monitoring will be positively correlated with effort attributions.
- Metacognitive knowledge, self-monitoring, and attributions to effort will be negatively correlated with depressive feelings.
- Students with LD, more than students without LD, will be characterized by a poor metacognitive system, low attributions to effort and high attributions to external factors, low self-esteem, low perception of self-efficacy, and depressive feelings.

At present, there is little empirical evidence demonstrating that depressive feelings in children and adolescents with LD are inversely related to metacognitive factors such as efficient self-monitoring or systematic attribution to effort. This investigation was designed to provide evidence relevant to this issue.

Specifically, our investigation had two goals. First, we wanted to verify, according to Borkowski's model, both positive correlations among specific strategic knowledge, self-monitoring, and effort attributions, and negative correlations between these variables and depressive feelings. Second, we wanted to investigate the predictions of Borkowski's model on a group of preadolescents with LD diagnosed according to *the Diagnostic and Statistical Manual of Mental Disorders* (4th ed. [*DSM–IV*]; American Psychiatric Association, 1994) compared to a control group without LD. We considered a heterogeneous group of students with LD. Distinctions between different specific types of learning disabilities were not considered of critical importance in the analysis of model components in this investigation: The model defines students with LD as those students with frequent experiences of failure in learning, independent of the specific nature of the learning disability (e.g., reading, mathematics). According to Borkowski's model, students with LD, compared to students without LD, would be expected to show (a) an inadequate metacognitive system, (b) lower attribution to effort and greater attribution to factors beyond their control, and (c) more marked depressive symptoms.

METHOD

Participants

Twenty-eight preadolescents participated in this investigation. Students were between 11 and 14 years of age and regularly attended secondary school. We selected 14 outpatients (13 male and 1 female) that came to the hospital in a midsize city in northern Italy. They were sent to our service (Institute of Developmental Neurology, Psychiatry, and Educational Psychology) for serious problems of learning associated with poor scholastic performances. Students selected were diagnosed with learning disabilities according to the following *DSM–IV* criteria (American Psychiatric Association, 1994):

1. Scores on standardized tests of reading (accuracy and comprehension),written skills, mathematical ability, or all, are substantially below the level expected, given the person's chronological age, measured intelligence, and age-appropriate education.
2. The deficit in Criterion 1 significantly interferes with academic achievement or activities of daily life that require these skills.
3. A sensory deficit was not present.

A battery of tests (see Materials and Procedures section) as well as relevant information from the student's teachers and

families were employed to evaluate Criterion 1. In particular, students were diagnosed with LD if their performance in at least one of the standardized tests administered was 1.5 *SD* below the mean. An outpatient was diagnosed with learning disabilities if a criterion of discrepancy between expected and observed performances was noticed by teachers in scholastic measures and by a psychologist in standardized tests. The second and third criteria were assessed on the basis of the information supplied by students' teachers and families.

Learning disabilities were thus identified in 14 outpatients: 2 students with mathematics disorders; 3 students with reading and written expression disorders; 2 students with written expression and mathematics disorders; 2 students with reading and mathematics disorders; and 5 students with reading, written expression, and mathematics disorders. None of the students in this study had ever received specific metacognitive training.

The control group consisted of 14 preadolescents chosen to match age, years of education, sex, and intelligence levels of the students with LD. The control group was selected from a sample of 56 students from 11 to 14 years of age: 19 students were in the sixth grade (M = 11 years 4 months), 19 in the seventh grade (M = 12 years 2 months), and 18 in the eighth grade (M = 13 years 3 months).

We thus identified two groups of preadolescents, a group with and a group without LD. Students with and without LD did not differ significantly with respect to measured intelligence (LD: M = 96.64, SD = 14.49; without LD: M = 103.86, SD = 11.15), $t(27) = 1.48$, *ns*.

Materials and Procedures

The following tests were administered individually in order to diagnose learning disabilities:

- *Test MT* 'MT Test', an Italian standardized test to measure reading comprehension and reading accuracy, errors, and reading speed (Cornoldi, Colpo, & Gruppo M. T., 1981).
- *Test di Matematica per la scuola dell'obbligo* 'A mathematics test for first- to eighth-grade students', an Italian standardized test to measure mathematical problem-solving skills (Amoretti, Bazzini, Pesci, & Reggiani, 1993).
- Selected parts of the *Batteria per la Valutazione della Scrittura e della Competenza Ortografica nella scuola dell'obbligo* 'Battery of writing and spelling tests to evaluate spontaneous writing skills from first- to eighth-grade students', an Italian standardized test to evaluate spontaneous writing skills (Tressoldi & Cornoldi, 1991).

To match groups for a general intelligence level, we administered individually the short form of Wechsler Intelligence Scale for Children–Revised (Silverstein, 1983), consisting of Information (verbal) and Block Design (performance) subtests. These subtests require a total administration time of about 20 min. They were administered individually in a quiet room, in the presence of the experimenter.

To evaluate strategic knowledge and monitoring, attributional beliefs, and aspects of the affective-motivational systems, we administered the following tests to both groups.

1. *Test di Metacomprensione* 'Metacomprehension Questionnaire' (Pazzaglia, De Beni, & Cristante. 1995): This standardized test was used to evaluate the areas of strategic knowledge (eight items) and self-monitoring (eight items each; time required was about 20 min). In this questionnaire, the area of strategic knowledge is investigated with binary or multiple-choice questions evaluating the aspects connected to good reading, the efficacy of reading strategies, and the appropriateness of their use with different materials. The section on monitoring contains brief selections or simple sentences where inconsistencies must be found. Reliability was assessed by Cronbach's alpha, which yielded coefficients of .76 (Items 1–8), .76 (Items 17–32), and .79 (Items 9–16).
2. *Test di Metamemoria* 'Metamemory Test' (Cornoldi & De Beni, 1989): This test was used to measure strategic knowledge and beliefs about memory processes (11 items; time required was about 15 min). This test consists of open and multiple-choice questions concerning memory skills with different materials (verbal vs. nonverbal), with variable intervals between the memorization and recall conditions (hours vs. days vs. months), and with different tests to evaluate memory (cued recall vs. free recall). Some questions also cover the student's personal beliefs about the capacity of memory, the causes of forgetting, and the characteristics of a good memorizer. Reliability and validity data are being collected and analyzed.
3. Children's Depression Inventory (Kovacs, 1988): This inventory was used to evaluate depressive symptoms (time required was about 15 min). The questionnaire contains 27 items, each developing an idea or feeling in three grades of low, medium, and high depressive content. Referring to feelings or ideas experienced in the preceding 2 weeks, students must choose one sentence among three choices that best describes them. Total scores may range from 0 to 54. The cutoff score of 13 discriminates between depressed (above 13) and nondepressed (below 13) students, as suggested by Kovacs (1983) for major depression.
4. *Questionario di Attribuzione* 'Attributional Questionnaire' (De Beni & Moè, 1995): This is a standardized test to evaluate a general attributional pattern. For each of the 24 situations proposed on the questionnaire, the student was asked to select one of five possible causes (effort, ability, task, external help, and luck). Half the situations proposed described successful outcomes; the other half described failures. Total administration time was about 30 min. Reliability data for the test, according to Cronbach's alpha, are effort = .69, lack of effort = .63, ability = .71, inability = .61, ease of task = .56, task difficulty = .55, good luck = .67, bad luck = .68, assistance = .61, lack of assistance = .66.

For the control group, these tests were administered in the classroom in the presence of a teacher and the experimenter. For the students with LD, these tests were administered individually in the presence of the experimenter; the tests were read aloud by the experimenter when student's reading ability required it.

RESULTS

Comparison Between Students With and Without LD

To compare the two groups (with and without LD), *t* tests were applied to each dependent variable.

Strategic knowledge and monitoring. Comparison of the groups revealed a significant difference in text comprehension monitoring skills (see Table 1). No significant difference in level of metacognitive knowledge was observed between the two groups, regarding either memory or comprehension.

Attributions. Participants with LD attributed success and failure to effort less than did the control group. However, more often than students without LD, they attributed their own success to the easiness of the task and attributed their failure to lack of help (see Table 2). No significant differences in the other variables were found between the two groups.

Depressive feelings and symptoms. Students with LD had significantly higher CDI scores than the control group (see Table 1). Referring to a cutoff score of 13 (Kovacs, 1983) to identify depressed students, we observed that 43% of the students with LD (i.e., six students) met the criteria for depression on this measure. None of the control group scored higher than 13.

Partial Correlation and Multiple Regression Analyses

Bravais Pearson partial correlations were carried out at the outset on the whole sample available. IQ scores were parceled out to exclude their covariance with the variables investigated and to control their influence.

TABLE 1
Means and Standard Deviations of Metacognitive Variables and CDI: Comparison With *t* Test Between Children With and Without LD

	Students With LD		*Students Without LD*			
	M	*SD*	*M*	*SD*	*t*	*p*
Metamemory	15.46	3.00	16.12	3.26	−0.55	*ns*
Strategies	6.00	1.71	6.79	1.48	−1.30	*ns*
Self-monitoring	6.28	3.59	11.04	1.75	4.44	< .001
CDI	11.79	5.56	6.93	3.45	2.78	< .01

Note. LD = learning disabilities; Metamemory = metamemory test of Cornoldi and De Beni (1989); Strategies = strategy knowledge in the metacomprehension test of Pazzaglia et al. (1995); Self-monitoring = self-motoring ability in the metacomprehension test of Pazzaglia et al. (1995); CDI = score obtained on Children's Depression Inventory (Kovacs, 1988).

Within the metacomprehension questionnaire, a positive correlation was found between strategic knowledge and self-monitoring ($pr = .533, p < .01$). This correlation is expected following Borkowski's model predictions: Strategies and processes of self-regulation are reciprocally related. The model relates an increase in strategic knowledge with a more efficient online regulation and monitoring, but it also suggests a reverse relationship in which strategic knowledge is affected by the monitoring efficiency of a strategic performance.

Results obtained with correlational analyses on the metacognitive and attribution questionnaires (see Table 3) revealed a *positive* partial correlation between (a) text comprehension strategic knowledge and self-monitoring scores and (b) effort attributions and a *negative* partial correlation between strategic knowledge and luck or help attributions. Results of partial correlational analyses showed a *positive* partial correlation between comprehension, strategic knowledge and self-monitoring, and attributions to task difficulty when situations described were unsuccessful. These results agreed with the main component of Borkowski's model: Strategic and self-regulated processes are mutually related to the awareness of the relevance of being strategic and, consequently, to the importance of making an effort when carrying out a task.

Further significant partial correlations were obtained between CDI scores and metacognitive and attributional variables: A negative partial correlation approaching significance was found between CDI and metamemory knowledge ($pr = -.351, p = .07$), and significant negative correlations were obtained between CDI and metacomprehension knowledge ($pr = -.613, p < .01$), CDI and self-monitoring ($pr = -.598, p < .01$), CDI and attribution to effort in successful situations ($pr = -.393, p < .05$), and CDI and attribution to task difficulty in unsuccessful situations ($pr = -.439, p < .05$). These correlations strongly supported the relationships between the metacognitive system and the self-efficacy system as described in the model. The uniqueness of Borkowski's model was the link between the self-regulation metacognitive system and the self-efficacy systems: Feelings of self-efficacy emerge when students can find a way of being strategic and can recognize the importance both of being strategic and of making an effort when carrying out a task. On the contrary, when the participant recognizes the relevance of strategic behavior and effort, feelings of self-efficacy will increase. Stability of the correlations was confirmed with a bootstrap procedure (Peladeau & Lacouture, 1993; Thompson, 1993).

Stepwise multiple regression analyses were conducted to further explore the relations between the variables of the model. Specifically, we investigated whether monitoring efficiency allows a person to predict attributional preferences and CDI scores, and whether IQ scores and group membership account for the variation in these dependent variables. We found that monitoring ability was the only powerful predictor of attributions to effort in an unsuccessful situation ($\beta = .476, p < .05$) and of CDI scores ($\beta = -.616, p < .01$). We found that group membership was the only relevant predictor of attributions to effort in successful situations ($\beta = .673, p < .01$). These results additionally support the relevance of monitor-

TABLE 2
Means and Standard Deviations of Attributional Variables: Comparisons Between Children With and Without Learning Disabilities

	Students With LD		*Students Without LD*			
	M	*SD*	*M*	*SD*	*t*	*p*
Effort						
Successful situations	23.46	3.28	29.84	4.31	−4.24	< .001
Unsuccessful situations	21.92	4.89	26.23	5.63	−2.08	< .05
Ability						
Successful situations	15.76	6.34	16.92	6.75	−0.45	0.66
Unsuccessful situations	13.84	3.60	13.92	4.78	−0.05	0.96
Task						
Successful situations	16.84	6.75	11.61	5.76	2.12	< .05
Unsuccessful situations	20.84	5.44	20.46	4.35	0.20	0.84
Luck						
Successful situations	8.07	5.63	7.07	4.53	0.50	0.62
Unsuccessful situations	9.30	5.82	7.92	5.53	0.62	0.54
Assistance						
Successful situations	7.46	4.85	6.07	3.06	0.87	0.39
Unsuccessful situations	6	4.39	3.53	1.98	1.84	0.08

Note. LD = learning disabilities.

TABLE 3
Partial Correlations Between the Factors Examined in Metacognitive, Attributional Questionnaires, and CDI

	Memory	*Strategy*	*Self-Monitoring*	*CDI*
Effort—s	.047	.297	.720**	−.393
Effort—u	−.155	.023	.400*	−.118
Ability—s	−.018	.118	.201	.111
Ability—u	−.113	−.112	−.323	.365
Task—s	−.033	.111	−.060	−.038
Task—u	.178	.479**	.410*	−.439*
Luck—s	−.010	−.438*	−.500**	.073
Luck—u	−.025	−.317	−.228	.031
Assistance—s	−.041	−.234	−.444*	.301
Assistance—u	.250	−.015	−.388*	.150

Note CDI = Children's Depression Inventory; s = successful; u = unsuccessful.
*$p < .01$. **$p < .001$.

ing processes in determining attributional preferences and positive feelings of self-esteem.

DISCUSSION

The results obtained in this study appeared to fit Borkowski's model. Partial correlation and multiple regression analyses broadly support the relations between the variables relevant to Borkowski's model. However, our data did not allow us to draw conclusions about the causality of the relations found: Correlational analyses do not indicate the causal direction of the relations considered.

With regard to metacomprehension, Borkowski et al. (1990) suggested that an increase in specific strategic knowledge produces more efficient self-monitoring processes. We observed that, in agreement with the model, specific strategic knowledge was positively correlated with self-monitoring.

Furthermore, comprehension monitoring and strategic knowledge were considered to be central in developing an adaptive attributive system and positive feelings about learning, school, and life. We found that comprehension, strategic knowledge, and monitoring correlated positively with attribution to effort and negatively with attribution to external factors (help and luck) and with depressive feelings. In particular, monitoring was shown to be an important variable in explaining the variance of attribution to effort and depressive feelings.

Taken together, these results adequately fit the model and support the hypothesis that strategic and self-regulated processes are reciprocally related to the awareness of the relevance of being strategic and to feelings of self-efficacy. These relations were expected, following the model's predictions: When children recognize that competence improves through their own efforts, they start enjoying learning, and conversely, positive feelings of self-efficacy influence motivation to effort.

Comprehension, strategic knowledge, and monitoring were positively related to attributions to task difficulty (external factor) in the case of failure. This result is not directly envisaged by Borkowski's model: Good learners should tend to attribute their own success and failure to effort. However, this result could be interpreted as a way of preserving self-esteem by blaming a person's own failure on external factors. In this way, the model maintains its predictive validity. It has been established that students with LD frequently fail at tasks such as reading comprehension or arithmetic problem solving, for reasons that are on the whole independent of effort. Students with LD can be strategic and attempt to control task execution without receiving positive feedback. It can be a good metacognitive strategy to attribute failures to task difficulty when they occur

frequently and are independent from effort: This attribution would allow for the preservation of self-esteem and an attributional system based on the relevance of effort.

Even the comparison between the two groups of students, with and without LD, supported the hypotheses. There were no differences in strategic knowledge between the two groups. Therefore, even the students with LD, after a few years of education (at least 5), reached an adequate knowledge of specific strategies. On the other hand, a difference was found between the two groups in monitoring efficiency. Students with LD had greater difficulty in terms of task execution control than did students without LD. These data are in agreement with the results obtained by Shapiro (1982) and by Kurtz and Borkowski (1984). Their results revealed differences between children with and without LD, not as far as knowledge about specific strategies was concerned, but rather on their current application. Students with LD employed specific strategies only if motivational training was included in their training program.

Paris and Winograd (1990) reported that normally achieving students attributed success or failure to effort more frequently than did students with LD. Students with LD reported a more external locus of control. They attributed success and failure to external aid and to task easiness and difficulty, as a poor information processor would do according to Borkowski's model.

Depressive symptoms were greater in students with LD, revealing a depressive condition in almost half of the students with LD. These data may be interpreted as evidence of the correlations between the model's metacognitive components (strategic knowledge, monitoring, and attributions) and the affective–motivational components.

These results seem to suggest that the cognitive–metacognitive system and the affective system of preadolescents with LD and without influence one another reciprocally. It could be hypothesized that students with LD, because of their low performances and repeated failures, presented significant deficits in the metacognitive system (particularly in the efficiency of control processes). These deficits help to generate a pattern of attributive beliefs typical of helpless students (Dweck, 1986), consequently leading to depressive feelings (Borkowski, 1992).

Our data may therefore seem to support and strengthen Borkowski's model: The results that emerged from the partial correlation and regression analyses fit the model's predictions in a way that was similar to that of the *t*-test comparisons between groups of students with and without LD. On the basis of the data collected, we would suggest that preadolescents with LD did not significantly differ from participants without LD with respect to their specific strategic knowledge, but they did lack adequate monitoring processes. We could assume that inadequate monitoring processes of students with LD mainly affect academic performance. Consequently, in agreement with the model's predictions, poor performance and consequent negative feedback affected the students' motivation, attributions, feelings, and, indirectly, their metacognitive monitoring on subsequent tasks. Moreover, data on depressive symptoms indicate that negative depressive feelings are strongly experienced by students with LD and they are significantly related to cognitive factors such as metacognitive control efficiency and attributional style.

LIMITATIONS OF THE STUDY

The possibility to draw more extensive implications from our results is reduced, first, by the limited number of participants that were included in our sample and, second, by an experimental design that did not allow for a thorough examination of the causality of the observed relations. Further research on the model's predictions is required to carefully examine the self-system, to extend the analysis of the metacognitive system from the area of memory and comprehension to other areas of learning, and to analyze the causal nature of the relationships that emerged.

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