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Learning Strategies and Study Approaches of Postsecondary Students With Dyslexia

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The present study describes the self-reported learning strategies and study approaches of college and university students with and without dyslexia and examines the relationship of those characteristics with reading ability. Students with (n = 36) and without (n = 66) dyslexia completed tests measuring reading rate, reading comprehension, reading history, learning strategies, and learning approaches. The results indicated that students without dyslexia obtained significantly higher scores than students with dyslexia in their reported use of selecting main ideas and test taking strategies. Students with dyslexia reported significantly greater use of study aids and time management strategies in comparison to students without dyslexia. Moreover, university students with dyslexia were significantly more likely to report a deep approach to learning in comparison to university students without dyslexia. Reading ability correlated positively with selecting main ideas and test taking strategies and negatively with use of study aids. The authors interpret the learning strategy results as consequences of and compensations for the difficulties that students with dyslexia have in word reading.

Keywords: *adults; dyslexia; learning strategies; approaches to learning; compensated dyslexics; postsecondary students*

Students with learning disabilities (LD) are entering postsecondary institutions in greater numbers today than in the past (Vogel et al., 1998). In the United States, Vogel et al. (1998) obtained information from 147 postsecondary institutions indicating that the proportion of students with LD was 0.69%. Lewis and Farris (1999) surveyed 1,000 postsecondary institutions in the United States and estimated that 195,870 students had identified themselves as having specific learning disabilities, representing 1.34% of the national population of 14.6 million students. Many students, however, do not disclose their LD upon admission to postsecondary institutions. Based on this lack of disclosure, Horn and Berktold (1999) estimated the proportion of undergraduate students with LD in the United States to be 1.61%. Studies carried out by the American Council on Education between 1991 and 1998 (Henderson, 1999) obtained even higher estimates of the percentage of students with LD in postsecondary institutions. Furthermore, in the United States, Vogel et al. found that the percentage of students with LD in postsecondary study was nearly four times higher at institutions with fewer than 5,000 students. For postsecondary institutions, particularly small to midsize institutions, it is increasingly important to further understand the cognitive limitations and compensatory strategies of students with LD in order to provide appropriate instruction in learning strategies and study approaches to maximize their academic success.

Dyslexia is one of several distinct learning disabilities. The research definition of dyslexia operationalized in this study, adopted from the work of the International Dyslexia Association and the National Institute of Child Health and Human Development (NICHD), identifies dyslexia as

> a specific learning disability that is neurobiological in origin. It is characterized by difficulties with accurate

> and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede growth of vocabulary and background knowledge. (Lyon, Shaywitz, & Shaywitz, 2003, p. 1)

Dyslexia is a lifelong disability, in that most individuals continue to experience significant reading- and writing-related problems throughout their adult lives (International Dyslexia Association, 2001). Due to their cognitive deficits in phonological processing, which lead to difficulties in word recognition and spelling, adults with dyslexia experience significant difficulty adjusting to the academic demands of higher education, for instance in taking lecture notes, writing essays, synthesizing course material for examinations, or comprehending large quantities of complex text (Gilroy & Miles, 1996; Riddock, Farmer, & Sterling, 1997; Simmons & Singleton, 2000). Some postsecondary students with dyslexia, termed *compensated* dyslexia, employ strategies and study approaches that enable them to partially circumvent the difficulties in word reading they experience (Lefly & Pennington, 1991; McLoughlin, 1997; McLoughlin, Fitzgibbon, & Young, 1994). Although the learning strategies and study approaches of typically achieving students have been studied extensively (e.g., Biggs, 1987; Entwistle & Ramsden, 1983), little is known about the methods that postsecondary students with dyslexia employ to cope with their academic responsibilities.

The purpose of the present study is to describe the learning strategies and study approaches reported by postsecondary students with and without dyslexia and to examine the relationships of those characteristics with reading ability. We see these as steps toward determining what problems exist, what strategies are effective, and what might be helpful targets for instruction.

Entwistle and Waterson (1988) distinguished two theoretical positions related to the learning behaviors of postsecondary students: learning and study strategies (Weinstein, 1987) and student approaches to learning (Biggs, 1979, 1987; Entwistle & Ramsden, 1983). Both approaches assess learning characteristics by means of self-report questionnaires and can be contrasted with observational methods, in which strategies are observed or inferred from performance. The latter technique is more precise and objective, but may fail to reveal students' beliefs or understandings of academic tasks. We examine each of Entwistle and Waterson's positions in turn.

Learning and Study Strategies

This theoretical viewpoint of *learning and study strategies* is concerned with the cognitive strategies that students apply to learning contexts. The most widely employed assessment of these strategies is Weinstein's (1987; Weinstein, Palmer, & Shulte, 2002) *Learning and Study Strategies Inventory* (LASSI). The LASSI is a 10-scale self-report assessment of students' awareness and use of learning strategies related to will, self-regulation, and skill components of strategic learning (H & H Publishing, 2005). The LASSI scales related to the will component of strategic learning are Attitude, Motivation, and Anxiety. These scales measure, for example, students' receptivity to, attitudes to, and interest in learning; willingness to exert the necessary effort to successfully complete academic requirements; and the degree to which they worry about their academic performance. Four LASSI scales measure the self-regulation component of strategic learning: Concentration, Time Management, Self-Testing, and Study Aids. These scales measure how students self-regulate and control the learning process through focusing their attention and maintaining their concentration, using time effectively, checking to see if they have met the learning demands for a class or test, and using strategy supports such as tutors. LASSI scales related to the skill component of strategic learning are Information Processing, Selecting Main Ideas, and Test Taking Strategies. These scales examine students' learning strategies; skills and thought processes related to identifying, acquiring, and constructing meaning for new information and ideas; and how they prepare for and demonstrate new knowledge on tests and examinations.

The Selecting Main Ideas, Study Aids, Time Management, and Test Taking Strategies scales merit further elaboration due to their specific relevance to this study. The Selecting Main Ideas scale measures students' self-reported ability to identify important information embedded among less important information and details (sample item: "Often, when studying, I seem to get lost in the details and miss the important information"). The Study Aids scale assesses students' self-reported use of supports or resources to help them learn or retain information (sample item: "I use special study helps, such as italics and headings, that are in my textbook"). The Time Management scale measures students' self-reported use of time management practices such as scheduling (sample item: "I put off studying more than I should"). Finally, the Test Taking Strategies scale gauges students' self-reported use of test preparation and test taking strategies (sample item: "In taking tests, writing papers, etc., I find I have misunderstood what was wanted and lose points because of it").

There have been a number of studies showing the relationships between the LASSI scales and academic performance in postsecondary students. Sinkavich (1991) found a significant correlation between the LASSI Motivation scale and students' course performance. Nist, Mealey, Simpson, and Kroc (1990) reported that the LASSI Motivation, Anxiety, and Self-Testing scales correlated moderately with students' semester performance. Furthermore, Albaili (1997) analyzed differences between low-, average-, and high-achieving students on LASSI scales and found that low-achieving students scored significantly lower than average- and high-achieving students on all of the scales.

In terms of the LASSI performance of university students with LD, Kovach, Whyte, and Vosahlo (1990, cited by Kovach & Wilgosh, 1999) found that these students had lower scores on the Motivation, Selecting Main Ideas, Study Aids, and Test Taking Strategies scales compared to nondisabled peers. Kovach and Wilgosh (1999) found university students with LD to perform significantly below norms on Motivation, Selecting Main Ideas, Self-Testing, and Test Taking Strategies, while showing higher levels of Anxiety and Attitudes toward success. We were not able to find any other studies of the LASSI performance of postsecondary students with LD or dyslexia.

It is difficult to discern a clear pattern in these LASSI results. Every scale has shown at least some relation to achievement. Those most frequently found to relate to achievement or to distinguish between students with and without LD have been Motivation, Selecting Main Ideas, Anxiety, Test Taking Strategies, and Self-Testing. It is possible that institutional policies, local characteristics, and the variety of diagnoses grouped under the term *learning disabilities* lead to certain scales being more salient in some studies than in others.

Approaches to Learning

The concept of *approaches to learning* was introduced by Marton and Saljo (1976) and focuses on the interaction between a student and the learning context. More specifically, it refers to the predispositions and beliefs that students have about learning. Whereas the learning strategies theorists examine tactics or strategies that students report themselves as employing, the theorists of approaches to learning seek to uncover students' understanding of the nature and purpose of learning, which is thought to influence their choice of tactics and strategies, but which is also influenced by the learning context. Student approaches to learning are frequently assessed by the *Study Process Questionnaire* (SPQ; Biggs, Kember, & Leung, 2001) and are assessed on the dimensions of deep and surface processing. Students with a deep approach to learning report being motivated intrinsically to learn and attempting to comprehend underlying meanings of a learning task. As a result, these students report using higher order cognitive strategies in completion of tasks. Conversely, students with a surface approach to learning report being motivated by factors extrinsic to the task and, thus, are less likely to invest the proper time or effort required for successful completion. As a result, these students often report using cognitive strategies such as rote rehearsal of information for completion of a task, which are usually thought by instructors to be ineffective. Studies have demonstrated that a surface approach to learning is associated with poor academic outcomes (Biggs, 1979; Robin, McManus, & Winder, 2001; Trigwell & Prosser, 1991; Watkins, 1982). Biggs and Kirby (1983) found that Australian university students were more likely than Australian college students (i.e., students pursuing vocational programs) to report a deep approach to learning, and less likely to report a surface approach. The deep and surface dimensions are seen as distinct, allowing students to describe themselves as adopting a combination of the two.

We are not aware of any previous research examining approaches to learning in a sample of students with LD or dyslexia. However, it is possible to speculate that students with dyslexia would either have difficulty employing the deep approach, because of their text processing difficulties, and therefore be driven to the surface approach, or would adopt the deep approach to compensate for their lower level text processing difficulties.

Present Study

We set out to examine learning strategies and approaches to learning in groups of postsecondary students with and without dyslexia. Following from the aforementioned definition of dyslexia (Lyon et al., 2003), we see learning strategies and approaches to learning in students with dyslexia as consequences of or compensations for the more fundamental problems with word reading. These word reading problems make reading slower and more effortful and decrease the probability that deeper meaning will be able to be constructed (e.g., Perfetti, 1985), and, thus, students with dyslexia may report being less able to carry out certain types of strategy, such as identifying main ideas. Students with dyslexia who have reached postsecondary education are likely to have developed or been taught strategies for coping with their difficulties and, thus, are likely to report more use of compensation strategies, such as relying on study aids. Although these strategies or approach factors are not the cause of the problems of students with dyslexia, they are important because they may be an

additional impediment to learning and are often the target of interventions at the postsecondary level.

Students with dyslexia were selected on the basis of diagnostic information in their files at the offices dealing with special needs students at four institutions, and we confirmed that they had low word reading ability in spite of typical mental ability. We compared the students with and without dyslexia on measures of reading rate, reading comprehension, and on reports of serious reading or learning difficulties. We accepted the combination of typical mental ability, low word reading ability, and a history of reading difficulties as support for their diagnoses, acknowledging that there are substantial differences within this group. We then compared the students with and without dyslexia on the LASSI and SPQ scales.

The lack of research about students with dyslexia and the diversity of the findings did not allow hypotheses about specific scales. We also had no specific hypotheses regarding the approach to learning scores. We thought it possible that students with dyslexia would adopt a more surface approach to learning, because they have difficulty with text; but conversely, students with dyslexia who reach postsecondary education may do so because of a deeper approach to learning than is shown by many other students. Finally, we hypothesized that the strategy factors that distinguish between students with and without dyslexia would be related positively to reading ability.

Method

Participants

A total of 102 individuals participated in this study. Students with dyslexia (n = 36) and typically achieving students (n = 66) were recruited from four Canadian postsecondary institutions. The sample with dyslexia consisted of participants with a mean age of 22.60 years (SD = 5.22) and a mean of 16.70 years (SD = 3.12) of formal education; 17 of them were women. Students with dyslexia were recruited from the disability services or equivalent offices at Queen's University (n = 9), the University of Alberta (n = 7), Loyalist Community College (n = 10), and Trent University (n = 10). All students with dyslexia required a current diagnosis of reading disability from a regulated health provider (psychologist). To validate that diagnosis, we asked students to allow us access to their diagnostic records or to complete some further testing. Results were available for a variety of mental ability measures. *Wechsler Adult Intelligence Scale* (3rd ed.; WAIS-III; Wechsler, 2002) scores were available for 19 participants, yielding an average Verbal IQ of 100.7 (SD = 11.2) and an average Performance IQ of 109.6 (SD = 14.0). Two further participants had completed the WAIS-III, but their files only contained comments; for 1, the verbal score was described as being in the lower portion of the average range, and the performance score was average; for the other, Verbal IQ was described as in the lower portion of the average range and Performance IQ as below average. Eleven participants had completed the *Peabody Picture Vocabulary Test* (3rd ed.; PPVT-III; Dunn & Dunn, 1997) and *Raven's Standard Progressive Matrices* (Raven, 1947); the average PPVT-III standard score was 106.6 (SD = 8.1), and the average Raven's percentile score was 57.0 (SD = 23.6). The 4 remaining students did not consent to give us access to their files and did not complete further testing. We administered the *Woodcock Reading Mastery Test–Revised* (WRMT-R) Word Identification subtest to the students with dyslexia to assess word reading ability. For the 35 participants who completed this test, the average score was 86.49 (SD = 11.6), corresponding to an age equivalent score of 13.0 years (Woodcock, 1998). These results indicate that the sample with dyslexia was of average mental ability, but was seriously behind their same-age peers in word reading. One of our other measures, the *Adult Reading History Questionnaire–Revised* (described in the Measures section), assessed students' history of reading difficulties; the results (presented in the Results section) support the interpretation that these students had experienced persistent reading difficulties. Students with dyslexia received financial compensation—either $20 or a raffle ticket for a chance to win $200—for participating in this study.

The control group consisted of participants with a mean age of 20.34 (SD = 4.80) years and a mean of 14.95 (SD = 1.38) years of formal education; 58 of them were women. The control participants were drawn from the Psychology Subject Pool at Queen's University (n = 47) and volunteers from Loyalist Community College (n = 8) and Trent University (n = 11). The Subject Pool students received course credit for their participation, and the volunteers were offered $20 or a chance to win $200 as compensation for participating in the study.

It is important to note that the participants were drawn from two different types of institutions that exist in Canada. The university students were taking academic programs in a variety of disciplines at degree-granting universities. The college students were following vocational programs in various domains at institutions whose admission standards are generally lower than those of the universities. All participants in this study had completed high school.

Measures

Reading Speed and Comprehension

The *Nelson-Denny Reading Test*, Form G (Brown, Fischo, & Hanna, 1993) assesses a participant's reading

Table 1
Alpha Reliability Coefficients, Means, and Standard Deviations of Measures of Reading Rate, Reading Comprehension, and Reading History by Disability Status

		TA[a]		DYS[b]		
Measure[c]	α	*M*	*SD*	*M*	*SD*	*t*
NDRT Reading Rate		235.15	58.51	191.31	84.68	3.06**
NDRT Comprehension	.908	27.58	7.15	21.63	9.32	3.30**
ARHQ-R	.956	0.34	0.12	0.59	0.09	10.89***

Note: TA = typically achieving students; DYS = students with dyslexia; NDRT = *Nelson-Denny Reading Test* (Brown, Fischo, & Hanna, 1993); ARHQ-R = *Adult Reading History Questionnaire–Revised* (based on Lefly & Pennington, 2000).
a. $n = 66$; one student had no data for Reading Rate.
b. $n = 36$; one student did not complete the Reading Comprehension test.
c. The *df* for NDRT Reading Rate, NDRT Comprehension, and ARHQ-R are 99, 99, and 100, respectively.
**$p < .01$. ***$p < .001$.

rate and comprehension. The Comprehension subtest has a 20-min time limit and consists of seven reading passages with 38 questions testing the individual's ability to derive facts or make inferences from the reading passages. A multiple-choice response format follows each question with five answer choices per item. Reading comprehension as referred to in this study is the number of questions the participants answered correctly on this test within the 20-min time limit prescribed in the manual. Reading rate is determined by the number of words read on the first passage in 1 min. Table 1 shows means, standard deviations, and alpha reliability coefficients for these measures.

Word reading. The Word Identification subtest of the WRMT-R (Woodcock, 1998) was used to measure word reading ability and was administered only to participants with dyslexia. Participants are asked to read words presented without context. Instead of the usual booklet presentation, words were presented one at a time on a computer screen. The tester judged accuracy and recorded answers. The participant's score is the number of words read correctly. As recommended in the manual, testing was ended after six consecutive errors. The split-half reliability estimate in this sample was .94.

Reading History

The *Adult Reading History Questionnaire–Revised* (ARHQ-R) is based on the *Adult Reading History Questionnaire* (ARHQ) developed by Lefly and Pennington (2000), which in turn is a revised version of Finucci, Whitehouse, Isaacs, and Childs's (1984) *Reading History Questionnaire*. Lefly and Pennington added questions about learning letter names, learning to spell, reading speed, effort needed to succeed, and verbal short-term memory derived from their clinical experience and from more recent research on dyslexia. The scores on Lefly and Pennington's ARHQ are calculated by totaling the points on the 23 Likert scale items and then dividing by the maximum possible score ($23 \times 4 = 92$). The 23 items include 7 questions about performance in elementary school or as a child, 2 questions about performance in school in general, 1 question about "high school or college," and 13 questions relating to current reading performance. In the ARHQ-R, respondents are asked about their reading and spelling ability, reading speed, attitudes toward school and reading, additional assistance they received, repeating grades or courses, effort required to succeed, and print exposure—separately for elementary school, secondary school, and postsecondary education. Fifteen questions are specific to elementary school experiences, 19 focus on secondary school (junior high and high school), and 22 on the current status. For each item, scores vary between 0 and 4, and high scores indicate less reading activity, or more reading difficulty. The three scales can be analyzed separately or in combination. Separate analyses would be potentially useful with students with "compensated" dyslexia—those who may have experienced difficulties learning to read but whose current reading levels are within the typical range. As the participants in the study all had a current diagnosis of reading disability, only the combined score is used—that is, the proportion of the total points possible. For example, if a participant's responses to the 56 questions were given a total of 100 points, out of a maximum of 224 (56 questions × 4 points each), then he or she would obtain a score of .45 (100/224). Lefly and Pennington (2000) reported the internal consistency (alpha) of the original ARHQ to be .94, and the test–retest reliability over a 2-year period to be .87. For the current sample and version, the alpha coefficient was .96 (see Table 1).

Approaches to Learning

The *SPQ–Revised* (SPQ-R; Biggs et al., 2001) consists of 20 five-point Likert-type scale items, with responses ranging from *This item never/rarely applies to me* to *This item always/frequently applies to me.* It consists of two scales, one measuring the deep approach to

Table 2
Alpha Reliability Coefficients, Means, and Standard Deviations of Measures of Learning Strategies and Study Approaches by Disability Status

		TA[a]		DYS[b]		
Measure	α	*M*	*SD*	*M*	*SD*	*F*
LASSI						
Anxiety	.869	23.50	7.84	24.06	7.02	0.13
Attitude	.675	30.56	5.18	32.35	4.52	2.71
Concentration	.775	23.30	5.79	23.94	5.28	0.15
Information Processing	.801	27.61	5.66	29.31	5.67	2.10
Motivation	.803	29.79	6.08	30.81	5.55	0.69
Self-Testing	.787	22.12	6.36	22.39	6.81	0.04
Selecting Main Ideas	.836	28.08	5.96	24.22	6.41	9.23**
Study Aids	.663	22.83	6.04	26.56	5.08	9.86**
Time Management	.889	20.70	7.90	24.33	8.08	4.85*
Test Taking	.742	28.59	6.13	24.44	4.54	12.65**
SPQ-R						
Deep Approach	.793	26.92	6.48	29.61	7.29	3.67†
Surface Approach	.737	23.95	6.20	23.67	6.07	0.05

Note: TA = typically achieving students; DYS = students with dyslexia; LASSI = *Learning and Study Strategies Inventory* (Weinstein, Palmer, & Shulte, 2002); SPQ-R = *Study Process Questionnaire–Revised* (Biggs, Kember, & Leung, 2001).
a. $n = 66$. $df = 1, 100$.
b. $n = 36$. $df = 1, 100$.
†$p = .058$. *$p < .05$. **$p < .01$.

learning and the other measuring the surface approach, each of which has 10 items. Items are summed to obtain Deep Approach and Surface Approach scores. High scores on either scale indicate greater use of that approach. The Cronbach's alpha values for the current sample of .79 for the Deep Approach and .74 for the Surface Approach (see Table 2), are similar to those reported by Kember, Biggs, and Leung (2004) of .82 for Deep and .71 for Surface Approach.

Learning and Study Strategies

The LASSI second edition (LASSI-2; Weinstein et al., 2002) was designed to measure university students' use of learning and study strategies. The inventory is a 10-scale, 80-item multiple choice paper-and-pencil questionnaire measuring Attitude, Motivation, Time Management, Information Processing, Test Taking Strategies, Anxiety Management, Concentration, ability to Select Main Ideas, use of Study Aids, and implementation of Self-Testing strategies. Participants responded to each item on a 5-point Likert-type scale ranging from *not at all typical of me* to *very much typical of me*. The sum of the rating scores of items in the scale yields a scale score. Alphas for the scales (see Table 2) range from .66 to .89 for the current sample, comparable to those given in the manual (Weinstein et al., 2002).

Procedure

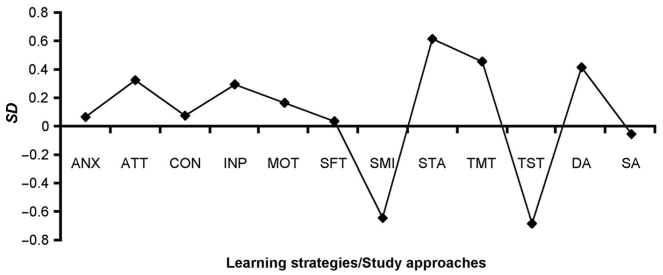
Participants were provided with a brief description of the study and then asked to read a letter of information and sign a consent form prior to commencing testing. All participants were tested individually in a quiet room. Following the completion of the testing session, participants were debriefed, and questions pertaining to the study were addressed. If relevant, participants were then provided with payment for their participation in the study.

Results

To examine whether the students with and without dyslexia were different on measures of reading, scores on Reading Rate, Reading Comprehension, and reading history were analyzed with two-tailed *t* tests for independent samples. The results (see Table 1) demonstrated that students without dyslexia significantly outperformed those with dyslexia on Reading Rate and Comprehension and that students with dyslexia reported a significantly greater history of reading difficulties. In terms of the distribution of the participants without dyslexia, students with dyslexia performed from ¾ *SD* to more than 2 *SD* below the mean.

The two groups were then compared on measures of learning strategies and study approaches (see Table 2). The results are also presented in Figure 1, in which the means of the group with dyslexia are shown in terms of the number of standard deviation units they are above or below the mean of the group without dyslexia (i.e., the standard deviation units are those of the group without dyslexia). A multivariate analysis of variance (MANOVA) was conducted to compare the two groups on the 10 scales

Figure 1
Learning Strategies and Study Approaches Profile of Postsecondary Students With Dyslexia, Expressed in Standard Deviation Units of Students Without Dyslexia



Note: ANX = Anxiety; ATT = Attention; CON = Concentration; INP = Information Processing; MOT = Motivation; SFT = Self-Testing; SMI = Selecting Main Ideas; STA = Study Aids; TMT = Time Management; TST = Test Taking; DA = Deep Approach; SA = Surface Approach.

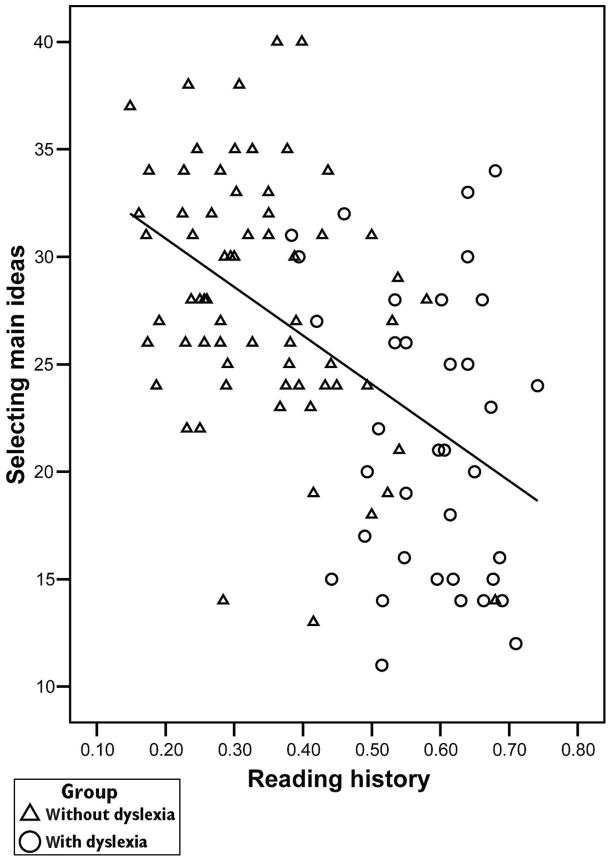
Table 3
Correlations Between Reading Performance Measures and Learning Strategies and Study Approach Scales for All Groups Combined

	NDRT		
Measure	Reading Rate	Reading Comprehension	ARHQ-R[a]
LASSI			
Anxiety Management	.15	.13	−.10
Attitude	−.11	.00	−.01
Concentration	.03	.07	−.10
Information Processing	.04	.03	−.02
Motivation	−.08	.06	−.01
Self-Testing	.09	.01	−.07
Selecting Main Ideas	.27**	.36**	−.49**
Study Aids	−.22*	−.18	.20*
Time Management	−.01	−.10	.12
Test Taking	.25*	.34**	−.44**
SPQ-R			
Deep Approach	.10	.03	−.06
Surface Approach	.01	−.15	.16

Note: NDRT = *Nelson-Denny Reading Test* (Brown, Fischo, & Hanna, 1993); ARHQ-R = *Adult Reading History Questionnaire–Revised* (based on Lefly & Pennington, 2000); LASSI = *Learning and Study Strategies Inventory* (Weinstein, Palmer, & Shulte, 2002); SPQ-R = *Study Process Questionnaire–Revised* (Biggs, Kember, & Leung, 2001).
a. Higher scores on reading history represent more reading difficulties.
*$p < .05$. **$p < .01$.

of the LASSI-2 and the Deep and Surface Approach scales of the SPQ-R. The Wilks's Λ of .615 was significant, $F(12, 89) = 4.62$, $p < .001$, indicating overall group differences.

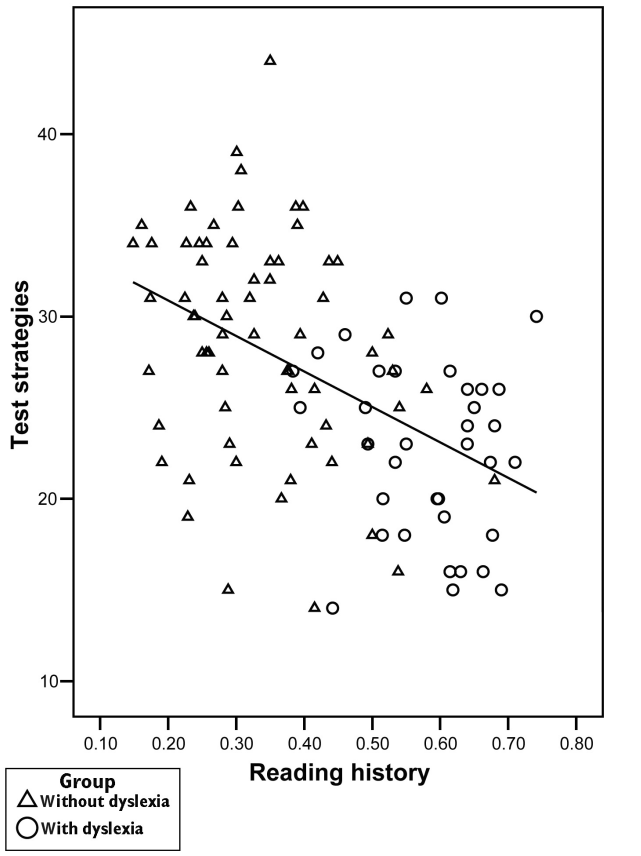
Figure 2
Scatter Plot and Line of Best Fit Illustrating Association Between History of Reading Difficulties and the LASSI-2 Scale of Selecting Main Ideas



Note: LASSI-2 = *Learning and Study Strategies Inventory* (2nd ed.; Weinstein, 1987; Weinstein, Palmer, & Shulte, 2002)

Follow-up univariate analyses (see Table 2) indicated four significant differences between the groups. Students with dyslexia had lower scores on Selecting Main Ideas, $F(1, 100) = 9.23$, $p < .01$, and Test Taking Strategies, $F(1, 100) = 12.65$, $p < .01$. However, students with dyslexia reported higher use of Study Aids, $F(1, 100) = 9.86$, $p < .01$, and of Time Management principles, $F(1, 100) = 4.85$, $p < .05$, compared to the group without dyslexia. The combined sample of university and college students did not differ on approaches to learning, although the Deep Approach effect, $F(1, 100) = 3.66$, $p = .058$, was close to the conventional level of significance. Because Biggs and Kirby (1983) had found a difference between university and college students, we repeated the analyses of variance for the university students alone (there were not enough college students for a separate analysis). An independent samples t test indicated a significant difference between the Deep Approach scores of university students with

Figure 3
Scatter Plot and Line of Best Fit Illustrating Association Between History of Reading Difficulties and the LASSI-2 Scale of Test Taking Strategies



Note: LASSI-2 = *Learning and Study Strategies Inventory* (2nd ed.; Weinstein, 1987; Weinstein, Palmer, & Shulte, 2002)

dyslexia (M = 30.17, SD = 7.12) and those without dyslexia (M = 27.09, SD = 6.13), $t(86) = 2.11$, $p = .038$. The groups did not differ on the Surface Approach scale (students with dyslexia, M = 23.93, SD = 6.65; students without dyslexia, M = 23.83, SD = 6.34).

The correlations between reading performance measures and learning strategies and study approaches subscale scores for the combined group of participants with and without dyslexia are shown in Table 3. Selecting Main Ideas and Test Taking Strategies was each associated with the three measures of reading performance—positively with Reading Rate and Comprehension and negatively with reading history (on which high scores represent more reading difficulties). Reported use of Study Aids was negatively related to Reading Rate and positively related to reading history, reflecting a greater reported use of aids by the participants with dyslexia. These results indicate that greater reading skill is associated with more self-reports of Selecting Main Ideas and using Test Taking Strategies and less use of Study Aids, echoing the findings of comparing the groups with and without dyslexia (see Table 1). Thus, our hypothesis that the strategy factors that distinguish between the groups would be correlated positively with reading ability is supported for Selecting Main Ideas, Test Taking Strategies, and Study Aids. This was not true for Time Management or Deep Approach, which had weaker effects in Table 2.

We drew scatter plots to investigate how having dyslexia influenced these correlations. Figures 2 and 3 illustrate the two strongest relationships, of reading history with Selecting Main Ideas and with Test Taking Strategies. These figures show that students with dyslexia tend to be in the upper segment of the reading history distribution (indicating greater difficulties) and, thus, at the lower end of both strategy distributions. In spite of this overall pattern, there is overlap between the groups. The scatter plots for the other correlations showed similar but weaker effects. The relationships between the strategy factors and reading measures were similar in both groups.

To further investigate the effects of group differences on these correlations, we calculated partial correlations, controlling separately for gender, age, institution (university or college), and status (dyslexia or not). In these analyses, with only a few exceptions, the pattern of results shown in Table 3 was maintained. The correlations of Selecting Main Ideas and Test Taking Strategies with the three reading variables were significant, with the exception that correlations with Reading Rate in the status analysis dropped just below the .05 level of significance. The correlations of Study Aids with Reading Rate and reading history remained significant in most instances, although correlations with reading history in the age analysis and with Reading Rate and reading history in the status analysis fell below the .05 level.

Discussion

The purpose of the present study was to examine the differences between postsecondary students with and without dyslexia with respect to learning strategies and approaches to learning. All students with dyslexia had been assessed extensively by their institutions, and our results regarding reading ability, reading history, and mental ability confirmed that the students with dyslexia had experienced reading difficulties for some time and continued to demonstrate lower reading skills, especially in word reading, in spite of their average mental ability.

The reading ability differences between groups were strongest for word reading and for reading history. Neither of these findings is surprising, given that the former is the key component in current theories and definitions of dyslexia and the latter reflects the participants' sense that they have long suffered from reading difficulties. The differences in Reading Rate and Comprehension were less strong but still substantial. These weaker effects suggest that the students with dyslexia have developed means to overcome their fundamental word reading difficulties to some extent, allowing them to succeed in postsecondary education. It is worth remembering that the measure of reading comprehension was timed. If reading speed and performance under timed conditions are characteristics of students with dyslexia, it may be that these scores underestimate how well they could have done under untimed conditions.

We found that students with dyslexia reported greater use of Time Management strategies and Study Aids and less use of Selecting Main Ideas and Test Taking Strategies. The latter two scales were two of the ones most frequently reported in the literature as related to achievement or distinguishing between students with and without dyslexia. As we suggest in the following section, both of these characteristics are plausible consequences of word-level reading difficulties. On the other hand, the reported greater use of Time Management and Study Aids may be a consequence either of greater word-level difficulties or of the focus on these strategies in support programs for students with dyslexia. It is also possible that typically achieving students have automated some of these processes (e.g., the use of headings assessed in Study Aids) and are less conscious of their use. The differences that we found were moderately strong; expressed in terms of the standard deviations of the typically achieving group, the effect sizes were .68 (Test Taking), .64 (Selecting Main Ideas), .62 (Study Aids), and .46 (Time Management; see Table 1 and Figure 1).

We also found that university students with dyslexia reported a deeper approach to learning than their typically achieving peers. This effect was weaker and did not reach the conventional significance level when the college (i.e., vocational) students were included. This is an intriguing finding, because we would expect the deep approach to learning to go hand in hand with learning strategies that support deeper learning, such as Selecting Main Ideas. The serious word reading difficulties of the students with dyslexia may prevent them from successfully implementing the learning strategy that would be most congruent with their general sense of what is required. It was reasonable to exclude the college students from this analysis, because they were following vocational programs in which the characteristics of deeper learning would be less valued and apparent. Biggs and Kirby (1983) found similar differences when comparing Australian college and university students' approaches to learning.

The deep approach to learning would also normally be consistent with the use of Test Taking Strategies, which reflect a metacognitive approach to learning that has been shown to be associated with deeper processing (Evans, Kirby, & Fabrigar, 2003). Again, it would seem that the enacted strategies of the students with dyslexia—at least as they report them—are incongruent with their approach to learning.

It is always difficult to know how to interpret self-report data. Do the self-reports provide an accurate picture of actual strategy use, or, for instance, are they more a general consequence of feelings of being a weak student? The latter possibility may be more of a risk in this study because of the inclusion of students with dyslexia. Although the final resolution of this issue must await a study in which actual strategies are observed in learning tasks, there are several reasons for not discounting these results as indicating actual differences in learning strategies and approaches to learning. First, the pattern of differences between students with and without dyslexia (see Table 2) shows a specific set of differences in the scales aforementioned; it does not show the generalized pattern of difference that would be expected if the responses of the students with dyslexia came from a general sense of inadequacy. Second, the two strategy scales with the strongest differences between groups (Selecting Main Ideas and Test Taking) were positively associated with reading ability (see Table 3), and these correlations survived controls of age, gender, type of institution, and dyslexia status. The correlations indicate that these particular learning strategy scales are tapping something associated with reading ability; again, the significant correlations were confined to a few strategy scales, not spread across the set of strategy and approach scales generally. Clearly, this is not unequivocal evidence for actual strategy differences between groups, but the evidence is not consistent with the assumption that the group differences are the consequence of general feelings of inadequacy as a student. Thus, it is worth interpreting these differences on the working assumption that they reflect real differences. There is, of course, a need to replicate these findings and to validate them in observational studies.

Compensation or Not?

How should we account for the apparent weaknesses in main idea selection and test taking strategies and the strengths in the use of study aids and time management (and, among university students, the deep approach to

learning) in students with dyslexia? These results are broadly consistent with a compensatory view of dyslexia in the postsecondary population. Adults with dyslexia continue to demonstrate serious lag in reading ability, especially at the word level, but they report strategies that can be seen as compensatory mechanisms. There appear to be positive and negative compensations. The word-level reading and reading-related problems of students with dyslexia—especially with regard to word recognition automaticity, phonological awareness, and phonological memory (e.g., Hatcher, Snowling & Griffiths, 2002; Kramer, Knee & Delis, 2000; Simmons & Singleton, 2000)—are well established. Inefficient (slow) or inaccurate word recognition makes text comprehension much more difficult. Slow word reading interferes with comprehension, because it requires that the material to be comprehended be present simultaneously in working memory, and slow reading results in some of the information decaying before the later information can be encoded. Inaccurate word reading interferes with comprehension by degrading the quality of the information that is being integrated (Perfetti, 1985). Thus, we see the students with dyslexia in the present study showing reading speed and reading comprehension (on a timed test) that is about three quarters of a standard deviation below that of their typically achieving peers. Our other results—if we take them as indicating actual strategy use—suggest that these reading difficulties drive the students in two directions: (a) toward deeper learning, use of study aids, and time management, perhaps because the details of what they read are difficult to obtain and retain and because they feel that they have too much to do; but (b) these challenges drive them toward relatively impoverished learning and test taking strategies. Both of these directions represent compensations—behavioral adaptations to deal with resource limitations.

The negative compensations are better understood than the positive ones. For example, Perfetti (1985) and others have suggested that students with dyslexia need to deploy so many resources to decode (due to processing speed and working memory deficits) that insufficient resources remain in a limited capacity system to, for instance, select main ideas from text. Furthermore, because test taking strategies require an understanding of what is important—another form of main idea recognition—it makes sense that students with dyslexia would have problems with test taking strategies. The lower endorsement of test taking strategies by students with dyslexia in comparison to typically achieving students can also be attributed to the greater investment in time that is required by these students for completion of readings and assignments. Not only do these students require more time, but, as Barga (1996) has argued, they often spend many hours with reading and writing specialists or receiving tutorial assistance from academic skills centers—all of which reduces the time available for studying and proper implementation of test taking strategies.

The three positive compensations concerned the use of study aids and time management and the adoption of a deeper approach to learning. One explanation for the high endorsement of Study Aids by students with dyslexia is the reduced amount of reading associated with aspects of these activities—for example, the use of text highlighting or reliance on notes or summaries. The use of study aids and time management are also emphasized throughout special education classes, from elementary to postsecondary education. Although it is true that other strategies are also emphasized, our evidence suggests that these two may be more frequently adopted or understood. Students with dyslexia may also be more aware than other students of using such strategies, perhaps because they find them more effortful. The preference of students with dyslexia for a deep approach to learning may reflect the difficulty that these students have with memorizing details, but it is also evidence of a commitment to high-quality educational outcomes. The greater age of the students with dyslexia in the present study is unlikely to be the explanation, as previous research has demonstrated that students' approaches to learning become less deep as they proceed through postsecondary education (Watkins & Hattie, 1985). More research is required to explore the factors that contribute to this strength.

Conclusion

The results of this study indicated that postsecondary students with dyslexia have a different profile of self-reported learning strategies and study approaches than their peers without dyslexia (see Figure 1). Although the students with dyslexia have partially compensated for their deficits, these results suggest that they still have significant difficulties with implementing learning strategies concerning identifying main ideas in text and preparing for tests. Lower endorsement on these scales is associated with weaker reading performance (see Table 3) for students with and without dyslexia. We argued that these problems most likely stem from inefficient and inaccurate word recognition, which in turn is caused by deficits in more fundamental processes, such as phonological awareness and phonological memory (see Lyon et al., 2003). This suggests three approaches for future research. The first is to confirm these self-report findings with observational studies, in which students' learning, reading, and test preparation behavior is

measured directly. It might be useful to contrast students' learning and comprehension performance under timed (as is traditional) and untimed conditions, as the latter should reduce the influence of slow word identification. The second approach is to explore the possibility of circumventing decoding automaticity deficits in postsecondary students with dyslexia through the use of adaptive reading technology, thereby conserving limited working memory resources, allowing for more attention to selecting main ideas and test taking strategies. Preliminary research with children with dyslexia has indicated that the use of adaptive reading technology improved reading comprehension (Elkind, 1998; Wise, Ring, & Olson, 2000; Wolf, 1999; Wolf, Bowers, & Biddle, 2000). The third approach is to focus instructional support for adults with dyslexia on the processes of main idea identification, summarization, note taking, and preparation for tests. These processes are consistent with their deeper approach to learning (Evans et al., 2003; Hadwin, Kirby, & Woodhouse, 1999; Kirby & Pedwell, 1991), but students with dyslexia may require considerably more instruction and strategy training to be able to execute them.

The results of this study demonstrate that postsecondary students with dyslexia report a learning strategy and study approaches profile that is distinct from that of other students. Further research is required to determine the sources of this difference and to explore ways to take it into account when designing instructional support programs for these students.

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