CLASSIFICATION OF STUDENTS WITH READING COMPREHENSION DIFFICULTIES: THE ROLES OF MOTIVATION, AFFECT, AND PSYCHOPATHOLOGY

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Abstract. **Attempts to evaluate the cognitive-motivational profiles of students with reading comprehension difficulties have been scarce. The purpose of the present study was twofold: (a) to assess the discriminatory validity of cognitive, motivational, affective, and psychopathological variables for identification of students with reading difficulties, and (b) to profile students with and without reading comprehension difficulties across those variables. Participants were 87 students who scored more than 1.3 *SD* below the mean on a standardized reading comprehension battery and 500 typical students in grades 2 through 4. Results using linear discriminant analyses indicated that students with reading comprehension difficulties could be accurately predicted by low cognitive skills and high competitiveness. Using cluster analysis, students with significant deficits in reading comprehension were mostly assigned to a low skill/low motivation group (termed helpless) or a low skill/high motivation group (termed motivated low achievers). Based on these findings, it was concluded that motivation, emotions, and psychopathology play a pivotal role in explaining the achievement tendencies of students with reading comprehension difficulties.**

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Recently several researchers have questioned the criteria by which students with learning disabilities (LD) are identified and classified as having specific learning disabilities by use only of the discrepancy between students' cognitive potential and achievement (e.g., Adelman, 1979; Francis et al., 2005; Vaughn & Fuchs, 2003). They have all emphasized the need for more classification/identification studies to enrich our understanding of the attributes and core characteristics of students with LD (e.g., Greenway & Milne, 1999; Kline, Lachar, & Boersma, 1993), and some have suggested the use of affective criteria as well (Vaughn &

Fuchs, 2003). Kline et al. (1993), for example, based on the early federal definition on parental input, suggested that personality characteristics can aid identification of the disorder. In a classification study using exploratory hierarchical cluster analysis, the authors drew attention to the fact that, besides having low scores on achievement and intellectual measures, students with LD also had high scores on psychopathology indices (e.g., psychotic features), a finding that agrees with the existence of psychopathological disturbances for students with LD (Breen & Barkley, 1984; Lufi & Darliuk, in press; Lufi, Okasha, & Cohen, 2004; Margalit & Zak, 1984; Martinez & Semrud-Clikeman, 2004; Noel, Hoy, King, Moreland, & Meera, 1992; Swanson & Howell, 1996). In a similar classification study, Sideridis, Morgan, Botsas, Padeliadu, and Fuchs (2006) pointed to the fact that several psychopathology, emotion, and/or motivation variables were significantly more important predictors of learning disabilities than various cognitive and metacognitive measures, although the importance of the latter has been well documented (Botsas & Padeliadu, 2003). Other recent studies have also pointed to the inability of cognitive variables alone to predict specific learning disabilities (e.g., Watkins, 2005). Thus, with regard to the taxonomy of characteristics and behaviors that describe the disorder, the jury is still out.

Most of the problems regarding identification and classification are based on either conceptual or methodological grounds. For example, several researchers have noted limitations in the definition of learning disabilities (e.g., Francis et al., 2005) or the measurement of IQ (MacMillan & Forness, 1998; Stuebing et al., 2002). Some of them took exception to the discrepancy between ability and achievement and proposed alternative models (e.g., Kavale, 2001; Meyer, 2000; Vaughn & Fuchs, 2003) by employing multiple criteria (Sofie & Riccio, 2002). Others expressed concerns regarding overidentification, pointing out problems with the specificity of the criteria used by each state (Scruggs & Mastropieri, 2002), or provided accounts of overidentification (MacMillan & Siperstein, 2001). Yet other researchers have attempted to address the problematic issues of heterogeneity, comorbidity, social, emotional, or cultural disadvantages, and inadequate instruction by focusing on how individuals react to learning (i.e., responsiveness to treatment) (e.g., Gresham, 2002; Vaughn & Fuchs, 2003). Finally, some authors have even raised concerns regarding the mere existence of the construct of LD (e.g., Fuchs, Fuchs, Mathes, Lipsey, & Roberts, 2001).

Thus, there may be a need to broaden the classification criteria of students with LD in order to understand the specifics of the disorder with the ultimate goal of developing effective interventions. In terms of motivation, the literature has been compelling with regard to the fact that students with learning deficits lack the motivation to engage in academic tasks (Bouffard & Couture, 2003; Fulk, Brigham, & Lohman, 1998; Lepola, 2004; Lepola, Salonen, & Vauras, 2000; Olivier & Steenkamp, 2004; Valas, 1999, 2001). Thus, lack of motivation or maladaptive motivational thinking may account for the large discrepancy between typical student groups and those with LD on their engagement with academic tasks (e.g., Pintrich, Anderman, & Klobucar, 1994).

For example, students with LD appear to possess the typical characteristics of helplessness (Sabatino, 1982; Sutherland & Singh, 2004). In a series of studies, Sideridis found that students with LD gave up significantly more easily compared to students without LD, viewed academic tasks as threats, developed negative emotions and cognitions both prior to and following an academic task, and employed regulatory systems that have their basis in avoidance motivation (Sideridis, 2003, 2005b, 2006a, 2006b, in press). The above effects were associated with regulation failure (i.e., students' inability to regulate academic-related behaviors that are conducive to learning and achievement). Given the salient role of these factors for reading behaviors in general, it is even more important to examine the contribution of motivational characteristics in students' learning and school experience (Guthrie & Cox, 2001; Guthrie & Wigfield, 1999; Lepola, Salonen, Vauras, & Poskiparta, 2004).

Affect and Learning Disabilities

Limited research has investigated the affective experience of students with learning disabilities. For example, Yasutake and Bryan (1995) noted that students with LD are at a greater risk for experiencing negative affect than their peers. Affective reactions (a) are thought to be primary and to precede cognitive processing (Forgas, 1991; Zajonc, 1980); (b) are considered automatic, not dependent on controlled processes; and (c) are believed to have an important impact on subsequent cognitive processing and behavior (De Houwer & Hermans, 2001). Therefore, the role of affective processing is of particular importance because it may contribute substantially to defining types of engagement and motivational states during engagement. With regard to negative affect, students with LD usually have higher levels than their typical peers (Manassis & Young, 2000). This finding has been linked to the difficulty of students with LD to socialize (Bryan, Burstein, & Ergul, 2004), in addition to their low achievement. Further, both outcomes have been associated with

these students' confusion, anxiety, and frustration at school (Bay & Bryan, 1991).

Psychopathology and Learning Disabilities

Another class of variables that may expand the classification scheme of LD is psychopathology. In a recent meta-analysis, the prevalence of depression among students with LD was estimated to be at about 88% of the reviewed studies (Sideridis, 2006a), with LD students exceeding normative levels (either compared to typical peers or compared to prevalence rates in the general population) (see also Maag & Reid, 2006). Similarly, the prevalence of anxiety disorders among LD students has been found to be well above normative levels (e.g., Lufi & Darliuk, in press; Lufi et al., 2004; Paget & Reynolds, 1984). Additionally, Sideridis et al. (2006) pointed to the fact that psychopathology accounted for significant amounts of variability in achievement, compared to several cognitive and metacognitive variables.

Based on the above, we suggest that classification studies are needed for at least three reasons: (a) because the identification criteria of the disorder have been questioned (Francis et al., 2005; Vaughn & Fuchs, 2003), and several researchers have asked for a reconceptualization of the disorder (Kavale, 2001; Sofie & Riccio, 2002); (b) because cognitive variables are sometimes poor predictors of LD (Forness, Keogh, MacMillan, Kavale, & Gresham, 1998; Watkins, 2005; Watkins, Kush, & Glutting, 1997; Watkins, Kush, & Schaefer, 2002); and (c) because empirical classification studies provide evidence of the presence of comorbid characteristics (e.g., Kline et al., 1993), which often are stronger predictors of LD-related outcomes than those from cognitive variables. Expanding the taxonomy of LD characteristics may be particularly important for the development of interventions that target both academic and nonacademic (e.g., social) outcomes.

We propose that the role of the above variables as indicators of LD has been greatly underestimated and hypothesize that motivation, affect, and psychopathology, along with cognition, will contribute to a fuller understanding of the disorder. Such an understanding will aid the development of interventions targeting both academic and nonacademic outcomes through various means (e.g., the development of motivated behavior).

Thus, one goal of the present study was to identify factors that significantly differentiate bewteen students with and without reading comprehension difficulties. Our decision to focus on text comprehension ability was based on the notion that extraction of meaning from text reflects the ultimate goal of the reading process, which in turn depends on several basic language and reading processing abilities (e.g., phonological awareness and decoding, and word recognition). Additionally, we sought to understand how individual predictors and linear combinations of those predictors explain the presence of subgroups of students with specific motivational and cognitive characteristics that are (or not) conducive to learning and achievement.

Thus, the present study was designed to answer the following two research questions:

1. Are motivation, emotions, and psychopathology significant predictors of reading comprehension difficulties?
2. How do motivational, emotional, and psychopathology indices interact with cognitive variables to form clusters of student profiles, and how are students with reading comprehension difficulties allocated into those profiles?

METHOD

Participants

Participants were 587 students (304 girls and 283 boys) in the 2nd (n = 209), 3rd (n = 192), and 4th grades (n = 186), from 17 Greek elementary schools in Crete, Attica, and the Ionian islands. School selection followed a stratified randomized approach in an effort to represent urban (seven), rural (three) and semi-urban schools (seven). All participating students were fluent speakers of the Greek language, had never been retained in a grade, and attended general education classes in their school. No student attended special education settings.

Selection Criteria

For the purposes of this study, children were selected on the basis of low reading comprehension performance. Reading comprehension is among the most important measures of reading skill as it addresses directly the desired end product of the reading task: the extraction and processing of meaning from the text. While word-level reading skill components, such as accuracy and fluency of reading aloud single words, are also important for reading achievement, and are the skills most frequently deficient in children with specific reading disability (RD) ("dyslexia") (Lyon, Fletcher, & Barnes, 2002), such "lower-level" reading measures are in part dissociable from reading comprehension performance (Oakhill, Cain, & Bryant 2003) and seem to express a different cluster of cognitive skills (Cain, Oakhill, & Bryant, 2004). Therefore, we chose to focus on what we consider the most important reading outcome measure.

In the last 15 years the use of IQ scores for identifying students with LD has been questioned widely

(Siegel, 1989, 2003). Many field experts seem to agree that alternative definitional criteria (such as reading achievement, certain linguistic processing skills, and response to intervention) are more suitable for classification purposes than discrepancy between IQ and achievement. This position is supported not only by the methodology of recent investigations (Bailey, Manis, Pedersen & Seidenberg, 2004; Manis, Seidenberg, Doi McBride-Chang, & Petersen, 1996; Joanisse, Manis, Keating, & Seidenberg, 2000) but also by the results of a wide survey among 218 editorial board members of the relevant field journals (Speece & Shekitka, 2002). Accordingly, an achievement criterion was chosen for this inquiry, as opposed to one based on discrepancy with presumed cognitive potential.

This approach was proposed by Fletcher, Francis, Shaywitz, Foorman, and Shaywitz (1998) because it is not restricted by the statistical limitations (such as regression to the mean) that are inherent in the IQ-reading achievement discrepancy formula. Furthermore, the reading achievement-based approach is supported by findings from a large-scale epidemiological study that supports a deficit model for reading disability rather than a developmental lag (Fletcher et al., 1994). According to this study, IQ-achievement discrepant readers and low-achieving readers did not differ in terms of reading growth. The latter group also presented a consistent reading and cognitive skill profile.

Current practices for RD classification in Greece vary widely among both private and public agencies. The lack of nationally normed assessment tools exacerbates the need for established and widely used criteria. In our sample, children were identified as RD if they scored below the 10th percentile ($p < -1.3$) on the reading comprehension subtest of the Test of Reading Performance (TORP; Padeliadu & Sideridis, 2000). The cut-off was purposefully set low (compared to the 25th percentile typically employed) to avoid overidentification and to keep the number of false positive errors as low as possible, taking into account that grouping was based on a single measure. The conservative cut-off score also ensured that children in the RD group were experiencing sufficiently severe difficulties in processing and deriving meaning from text, excluding children who simply scored in the low-average range.

The RD sample included 87 children with reading comprehension standard scores below (-1.3) standard deviations. There were 50 boys (57.5%) and 37 girls (42.5%). Children scoring above the mean on the same (reading comprehension) subtest formed the non-reading impaired group.

Procedures

All children were tested individually in two 40-minute sessions over three weeks in March of 2005. All testing took place at school and during school hours. Examiners had undergone long and rigorous training and were closely monitored by the study coordinator in an effort to standardize the administration procedures. During the first session, all students were tested on word and pseudoword reading accuracy, pseudoword and sight word efficiency, text comprehension, receptive vocabulary and spelling. In a subsequent session, students were given a set of questionnaires to answer.

Measures

Word and pseudoword reading accuracy and text comprehension. Reading accuracy and comprehension was assessed through Subtests 5, 6, and 13 of the Test of Reading Performance (TORP) (Sideridis & Padeliadu, 2000). Subtests 5 and 6 were word and pseudoword identification tasks structured according to other well-known tests of reading skill used widely (e.g., Word Identification and Word attack subtests from the Woodcock Johnson Psychoeducational Battery-Revised; Woodcock & Johnson, 1989). Responses were scored with a 0 (inaccurate item reading), 1 (phonologically correct but inaccurate use of stress), or 2 (phonologically accurate and correctly stressed response). TORP Subtest 13 was a reading comprehension task that included six passages of increasing length and difficulty. Students were given each passage and were asked to answer related multiple-choice questions after they had completed their reading and while the passage was still in view. Cronbach's alpha for word accuracy was .82; for pseudoword accuracy it was .90, and for reading comprehension, .80.

Spelling. Orthographic ability was assessed through a single-word spelling task consisting of 60 words selected from the basic vocabulary taught in grades 1-6. Words were arranged in order of ascending difficulty and were read in both isolation and a sentence context. Each word was scored with 1 point for accurate spelling. Stress errors were not scored due to the high frequency of occurrence. Alpha of the scale was .95.

Sight word reading efficiency. The construction of this task was based on the Test of Word Reading Efficiency (TOWRE; Torgesen, Wagner, & Rashotte, 1999) and was used to assess efficiency in automatic recognition of high-frequency words. Words were selected on the basis of frequency from a corpus of approximately 34 million lexical units compiled from a wide selection of Greek texts. A total of 112 words of increasing length and orthographic complexity were presented on a single page. Students were asked to name each word they could identify fast and skip the

words that required decoding, while moving from the top to the bottom of the list. Students received 1 point for each item that they accurately named (including stress) within 45 seconds.

Receptive vocabulary. The Greek adaptation of the Peabody Picture Vocabulary Test-Revised (PPVT-R; Dunn & Dunn, 1981) was used to assess students' receptive vocabulary. The adaptation was based on the original picture templates (Form L), but certain alterations (either on word sequence or word/target items) were considered necessary due to language and cultural differences. The adaptation was based on pilot data from both children and adults. The original basal and scoring administration rules were followed (scoring 0 or 1), whereas a more lenient criterion was adapted as a ceiling rule (test discontinuation after 8 incorrect answers within 10 consecutive questions). Alpha of the scale was .96.

Expressive vocabulary. In order to assess students' expressive vocabulary and verbal abilities, we used the Vocabulary subtest from the Greek version of Wechsler Intelligence Scales for Children III (WISC-III) (Georgas, Paraskevopoulos, Bezevegis, & Giannitsas, 2001). The child is asked to provide a definition for 30 different word items of ascending difficulty, and the task is scored (2, 1, or 0) according to the test criteria. Alpha of the scale was .77.

Reading motivation. Students' reading motivation was assessed using the revised Motivation for Reading Questionnaire (MRQ) developed by Wigfield and Guthrie (1995). The scale was first directly translated into Greek and then underwent an adaptation process to accommodate for cultural and educational differences between Greece and the United States. The questions that were included referred to different aspects of motivation to read, identified by the authors as corresponding to either extrinsic or intrinsic motivation, subjective values, and achievement goals (Wigfield & Guthrie, 1997). These aspects were reading efficacy, curiosity, challenge, involvement, importance of reading, and reading work/avoidance. Other aspects included competition, recognition, reading for grades, social reasons or compliance.

In a pilot study the translated questionnaire of 54 questions was administered to a sample of 81 students (8-10 years). Answers were presented in a 4-point scale ranging from 1 (Never/I don't like it at all) to 4 (Very often/I like it very much). Children were instructed to answer the questions honestly and encouraged to respond with their first thought. The examiner also emphasized that there were no right or wrong answers and that students could ask the examiner if they had any questions about the wording. Group administration time was approximately 20-30 minutes.

Internal consistency reliabilities and factor analyses were employed to assess the different motivation aspects proposed. Many of the questions were loaded on some of the proposed factors and many questions were discarded because they failed to yield loadings higher than .30. The final set consisted of 31 questions that corresponded to the following aspects of motivation for reading: reading efficacy (three questions), challenge (five), curiosity (six), reading involvement (six), recognition (five), competition (six). The set was finalized by adding three questions aiming at detecting lying behavior. The specific internal consistency estimates were .72, .71, .61, .66, and .70 for reading efficacy, challenge, curiosity, recognition, and competition, respectively. Similar internal consistency estimates have been reported previously (Watkins & Coffey, 2004).

Anxiety. In order to obtain an index of the child's anxiety level, the Greek translation of the Revised Children's Manifest Anxiety Scale (RCMAS) by Reynolds and Richmond (1978, 1985) was used (see Sideridis, 2003). This is a self-report scale developed to access anxiety levels in children and adolescents 6 to 19 years old. The Greek adaptation consisted of 28 items that were scored using a 3-point scale to indicate the perceived frequency of specific behaviors (very often, some times, never). It includes the following subscales: physiological concerns, worry/oversensitivity and social concerns/concentration. Alphas were .70, .76, and .57, respectively, for physiological concerns, worry/oversensitivity, and social concerns/concentration. The estimate for internal consistency for the full scale was .86.

Depression. The Children's Depression Inventory (CDI; Kovacs, 1985) was used to access children's depression symptoms. The CDI is a self-report, symptom-oriented scale designed for school-aged children and adolescents. The Greek translation included 26 items, which have been widely used in past studies (e.g., Sideridis, 2005b). The children were instructed to select one sentence out of three that best described their current emotional state (very often, sometimes, never). The CDI profile contains the following five factors: negative mood, interpersonal problems, ineffectiveness, anhedonia, and negative self-esteem. Alphas were .64, .22, .48, .47, and .35, respectively. Because of the low alpha values of all factors but negative mood, only the total score was used, which produced an alpha equal to .78.

Affect. Affect was measured by the Greek translation of the Positive and Negative Affect Schedule (PANAS) developed by Watson, Clark, and Tellegen, (1988) (see also Watson & Clark, 1992). The PANAS includes 10 items measuring positive affect (e.g., "Interested,"

"Excited," and "Strong") and 10 items measuring negative affect (e.g., "Distressed," "Upset," and "Hostile"). All items were scored on a 4-point scale ranging from (1) None to (4) Very much so. Alphas were .74 for positive affect and .83 for negative affect.

Data Analysis

First a series of one-way analyses of variance (ANOVA) were run to evaluate differences between groups at the mean level for each measured variable (using a *z*-score transformation). Then, all variables were linearly combined and served as predictors of student membership (RD or typical) using a Bayesian Standardized Canonical Discriminant Function Analysis (BSCDFA). The BSCDFA was run in an exploratory fashion to estimate the contribution of all indicators when interacting with each other (rather than to identify the most parsimonious linear combination). The Bayesian approach was selected so that the probability of group membership would take into account the probability that a student with RD would belong to the general population. Those probabilities (priors) were estimated from group sizes. The model was run with standardized predictors, hence the term standardized canonical analysis (Sharma, 1996).

Extending the BSCDFA classification, a series of Receiver Operating Characteristic Curves1 (ROC) were fit to identify individual predictors of reading comprehension difficulties membership, after controlling for specific assumptions.[2,3] Last, an exploratory two-step cluster analysis was run to test the existence of subgroups of students with different cognitive and motivational profiles that are conducive (or not) to learning. This method was preferred to a K-means cluster analysis or hierarchical cluster analysis because it is exploratory and does not require an à priori specification of the number of clusters.

Statistical power was estimated for all analyses, and the large sample size provided ample levels (Cohen, 1992; Onwuegbuzie, Levin, & Leach, 2003). For the analysis of variance test, power was 1.00 given a medium effect (i.e., .50 SD) for a two-tailed test at the .05 level. For the discriminant and cluster analyses, estimates were 1.00. Finally, power for the ROC analyses was estimated to be 1.0 for an alternative hypothesis that an AUC (areas under the curve) of .700 is significantly different from chance (i.e., .500). The .700 level was selected because it represents non-chance classification (Hsu, 2002).

RESULTS

Intercorrelations Between Variables

As shown in Table 1, intercorrelations were slightly more pronounced for the students with reading comprehension difficulties than for typical students for most bivariate relations. Almost all motivational variables were positively related to positive affect, and this effect was stable across groups. Word reading efficiency and motivation were related positively for the LD student group, but the respective association for the typical students was null. This finding is indicative of the probable higher role that motivation plays for students with LD concerning achievement outcomes. Depression and anxiety had negative associations with most motivational and cognitive variables, and the effects were slightly more pronounced for the typical student group.

Mean Differences Between Students with and Without RD in Motivation, Affect, Psychopathology, and Cognition

Results of analyses of variance (ANOVA) pointed to salient between-group differences across various comparisons (see Figure 1). Specifically, there were significant between-group differences on word reading efficiency, $F(1, 585) = 59.060$, $p < .001$; WISC-Vocabulary, $F(1, 585) = 95.620$, $p < .001$; reading accuracy, $F(1, 585) = 118.637$, $p < .001$; PPVT, $F(1, 585) = 128.119$, $p < .001$; spelling, $F(1, 585) = 80.741$, $p < .001$; curiosity, $F(1, 585) = 4{,}829$, $p < .05$; challenge, $F(1, 585) = 7.454$, $p < .05$; competition, $F(1, 585) = 8.462$, $p < .01$; and negative affect, $F(1, 585) = 3.955$, $p < .05$. These findings reflect lower levels for the RD group on language achievement and motivation, and higher levels on negative affect.

Discriminant Validity of Motivation and Cognition to Predict RD Group Membership

A series of discriminant analyses were run to identify linear combinations of variables that are predictive of reading comprehension difficulties. One or more linear equations were formed in an effort to explain the between-group differences in the measured variables. One of the most crucial assumptions of discriminant analysis is related to the potential problem of multicolinearity of predictors, which produces linear dependency among variables and is associated with unstable discriminant functions and heavy misclassifications (Sharma, 1996). Examinations of the correlations between predictors using tolerance criteria 1-CCS (Canonical Correlation Squared) indicated that none of the predictors was linearly dependent on another predictor. Equality of covariance matrices between groups was not satisfied using Box's *M* statistic. However, this test is heavily influenced by sample size and, as Sharma (1996) stated, "for a large sample even small differences between the covariance matrices will be statistically significant" (p. 264), which was likely the case for our large sample. Nevertheless, evidence from simulations

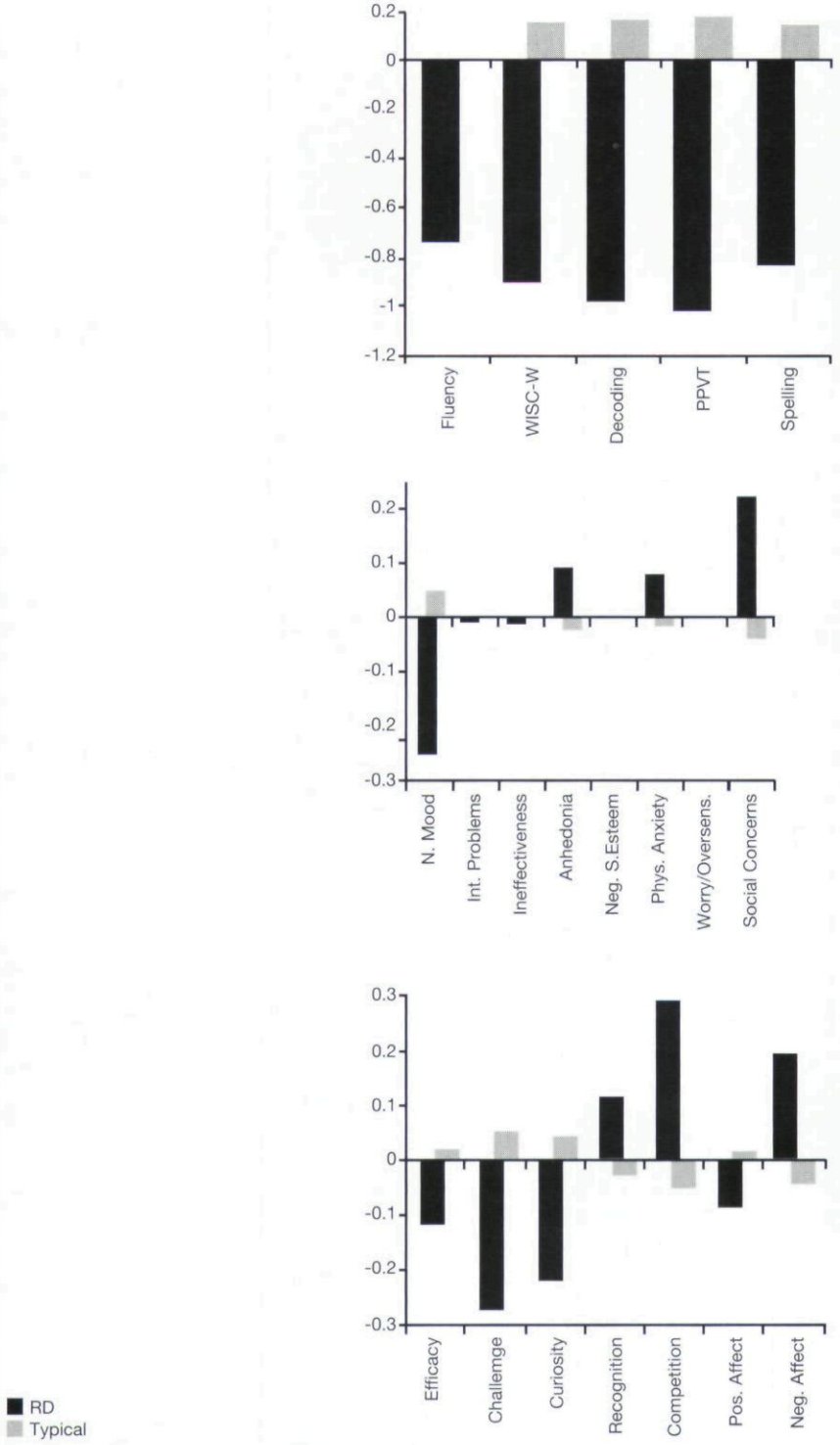
Table 1

Intercorrelations Between Variables Across Student Groups

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Students with Reading Comprehension Difficulties														
1. Efficacy	—													
2. Challenge	.51**	—												
3. Curiosity	.63**	.67**	—											
4. Recognition	.47**	.35**	.44**	—										
5. Competition	.28*	.23*	.31**	.56**	—									
6. Positive Affect	.38**	.37**	.43**	.52**	.35**	—								
7. Negative Affect	-.09	.07	-.03	-.02	-.07	.55**	—							
8. Depression	-.41**	-.22*	.23*	-.17	-.10	-.26*	.29**	—						
9. Anxiety	-.28*	-.13	.15	-.08	.03	-.21*	.35**	.59**	—					
10. Receptive Vocabulary (PPVT)	-.04	.15	.14	-.05	.05	.15	-.22*	.04	.07	—				
11. Spelling	.08	.17	.12	.17	.20	.12	-.32**	-.13	-.09	.28**	—			
12. Expressive Vocabulary (WISC)	-.13	.01	.05	.01	.11	.22*	-.23*	.04	-.01	.59**	.40**	—		
13. Word Reading Efficiency	.13	.27*	.24*	.22*	.17	.26*	-20	-.13	-.12	.21	.82**	.33**	—	
14. Reading Accuracy	.06	.09	.08	.12	.12	.21	-.21*	-.06	-.06	.23*	.66**	.34**	.67**	—
Typical Students														
1. Efficacy	—													
2. Challenge	.30**	—												
3. Curiosity	.26**	.53**	—											
4. Recognition	.29**	.24**	.29**	—										
5. Competition	.26**	.20**	.17**	.54**	—									
6. Positive Affect	.20**	.29**	.29**	.30**	.33**	—								
7. Negative Affect	-.08	.01	.02	-.04	-.01	-.05	—							
8. Depression	-.32**	-.25**	.25**	-.22**	-.25**	-.35*	.38**	—						
9. Anxiety	-.23**	-.13*	-.15*	-.14*	-.12**	-.23*	.39**	.69**	—					
10. Receptive Vocabulary (PPVT)	-.06	.02	-.08	-.19**	-.13**	-.12**	-.16**	.07	.03	—				
11. Spelling	.12*	.01	-.02	-.09	-.14**	-.08	-.10**	.07	.07	.45**	—			
12. Expressive Vocabulary (WISC)	-.01	.04	-.05	-.16**	-.13**	.22*	-.16**	.06	.06	.61**	.48**	—		
13. Word Reading Efficiency	.18**	.05	-.02	-.08	-.13*	-.10*	-.08	.05	.09	.36**	.78**	.41**	—	
14. Reading Accuracy	.10*	.02	-.04	-.07	-.07	-.06	-.12*	.06	.02	.40**	.60**	.39**	.54**	—

Note. Correlations are significant at $*p < .05$, $**p < .01$.

Figure 1. Between-group differences in achievement (in *z*-scores) (upper panel), in psychopathology (middle panel), and motivation and affect (lower panel).



has suggested that the linear discriminant function analysis model is robust to violations of the key assumptions (Marks & Dunn, 1974).

A series of discriminant analyses were run to evaluate the discriminant validity of the indicators for (a) the full sample, (b) each grade, and (c) two samples created using the Holdout method of cross-validation. Table 2 shows the discriminant functions obtained from each analysis. With regard to classification, correct rates were 87.7% for the full sample, 81.3% for grade 2, 91.7% for grade 3, 94.6% for grade 4, 87.5% for cross-validation Sample 1, and 88.7% for cross-validation Sample 2. All discriminant functions explained variance of 19-28%, which was significant and is in the range of medium to large effect sizes using Cohen's (1992) criteria (see also Harlow, 2005). As shown in Table 2, for the full sample, the most significant positive predictors were reading accuracy, PPVT, and WISC vocabulary, with competition being a negative predictor of group membership (a weaker effect was also present for anxiety). The above four predictors produced effect size estimates between medium and high (PPVTES = .23, reading accuracyES = .25, WISC-vocabulary ES = .05, competitionES = .06). Given that the RD group had a mean in that discriminant function of -1.408 compared to a mean of .246 for the typical group, it appears that members of the RD group can be predicted by low scores on language measures (reading accuracy, receptive and expressive vocabulary measures) and high scores on competitiveness. This linear combination fit the data well as 26% of the variance between groups was accounted for by the

Table 2

Discriminant Function Coefficients for the Prediction of Reading Comprehension Difficulties by Use of Motivation, Affect, Psychopathology, and Cognition

	Standardized Discriminant Function Coefficients					
Variables	**Full Sample**	**Grade 2**	**Grade 3**	**Grade 4**	**Cross 1**	**Cross 2**
Efficacy	.036	-.150	.173	.053	-.112	.226
Challenge	.063	.053	.119	.146	.134	-.071
Curiosity	.138	.275	.063	.117	.087	.189
Recognition	.098	-.005	.118	.300	.114	.093
Competition	-.251	-.296	-.173	-.485	-.143	-.344
Positive Affect	.074	.251	-.254	.065	.118	.038
Negative Affect	.082	.135	.134	.241	.088	-.012
Depression	.112	-.027	.221	.142	.201	.007
Anxiety	-.172	-.139	-.413	.093	-.186	-.112
Receptive Vocabulary (PPVT)	.483	.431	.478	.382	.518	.436
Spelling	.077	.121	.373	.252	.054	.140
Expressive Vocabulary (WISC)	.223	.271	.160	.365	.063	.368
Word Reading Efficiency	-.073	-.055	-.294	.113	-.035	-.108
Reading Accuracy	.504	.604	.436	-.012	.590	.317

Note. Using the bootstrap method (Bone, Sharma, & Shimp, 1989; Efron, 1987), cross-validation rates were 86.9% for the full sample, 78.9% for grade 2, 88.5% for grade 3, 91.4% for grade 4, 87.2% for cross-validation Sample 1, and 84.7% for cross-validation Sample 2.

Table 3

Conditional Probabilities Expressing Outcomes from ROC Analyses

	True State of Affairs Regarding Comprehension Difficulties	
Test's Findings	**Present**	**Absent**
Present	$_a$(true positive fraction - TPF)	$_b$(false positive fraction - FPF)
Absent	$_c$(false negative fraction - FNF)	$_d$(true negative fraction - TNF)

Note. The subscripts *a, b, c,* and *d* represent the probability of a person belonging to that cell combination. The combinations are as follows: (a) presence of comprehension difficulties and confirmation from test's results, (b) absence of comprehension difficulties and disagreement by test, (c) presence of comprehension difficulties and lack of support from the test's results, and (d) absence of comprehension difficulties and agreement by the test. Sensitivity = (true-positive rate) = $a/(a + c)$ = *P(Positive Test | Comprehension Difficulty);* specificity = *(true-negative rate)* = $d/(b + d)$ = *P(Positive Test | Comprehension Difficulty);* positive predictive power = $a/(a + b)$ = *P(Comprehension Difficulty | Positive Test);* negative predictive power = $d/(c + d)$ = *P(Comprehension Difficulty | Positive Test).* For a detailed description of the formulae, see Hsu (2002) and Grilo et al. (2004).

independent variables, pointing to a large effect size (Cohen, 1992).

Examination of the pattern of relationships across grades indicates that the motivational and psychopathological variables get to be stronger predictors as students become older, with the exception of psychopathology in grade 4. For example, competition weighs more heavily on the prediction of the dependent variable (reading comprehension membership), and reading accuracy becomes a variable with identifiable effects for grade 4 students, although the respective effects for younger students were of lesser magnitude. Interesting, the pattern of relationships leading to comprehension changes by grade, with older students relying more heavily on spelling and vocabulary measures and less on reading accuracy. Thus, this finding likely implies that students of older grades are more mature to identify and report motivational schemas and their emotions compared to younger students; it also likely highlights the importance of motivation and emotions for older students.

Discriminant validity of individual predictors. In this step we employed Receiver Operating Characteristic Curves (ROC; Hanley & McNeil, 1982, 1983) in order to determine the saliency of individual variables for predicting group membership. Results highlighted the importance of the language measures (see Figure 2). Specifically, spelling and vocabulary were associated with areas under the curve (AUC) of .861 and .762, respectively, suggesting accurate classification rates. Similarly, reading accuracy was associated with non-chance classification (AUC of .798). None of the psychopathological, affective, or motivational variables was accurate predictors of reading difficulties when looking at the whole sample.

ROC curve analysis provides additional indices of classification accuracy (see Table 3). These include (a) sensitivity (i.e., accurate identification of students with reading comprehension difficulties, termed *true positives);* and (b) specificity (i.e., accurate classification of typical student cases, called *true negatives)* for a specific cut-off value (Hsu, 2002). Two additional indices, *positive predictive power* (PPP) and negative predictive power (NPP) determine classification accuracy. The PPP index answers the question: "What is the probability that a student has a reading comprehension deficit given that the test results are positive?" whereas the NPP index addresses the question: "What is the probability that a student does not have reading comprehension difficulties given that the test results are negative?" Results indicated that almost all cognitive variables were significant predictors of reading comprehension difficulties whereas only a few of the psychopathological variables had that effect (see Table 4 and Figure 3). This finding implies that reading comprehension difficulties can be mostly explained by cognitive factors and less by psychopathology at the individual level.

Figure 2. The upper-left panel shows ROC curves for word reading efficiency, WISC vocabulary, reading accuracy, PPVT, and spelling for the total sample. The lower-left panel shows the ROC curves for grade 2 students. The upper-right panel shows the ROC curves for grade 3 students and the lower-right panel shows the ROC curves for grade 4 students. The horizontal axis indicates false-positive rates (correct classification of cases not having RD), whereas the vertical axis shows rate of true positives (correct classification of students with RD).

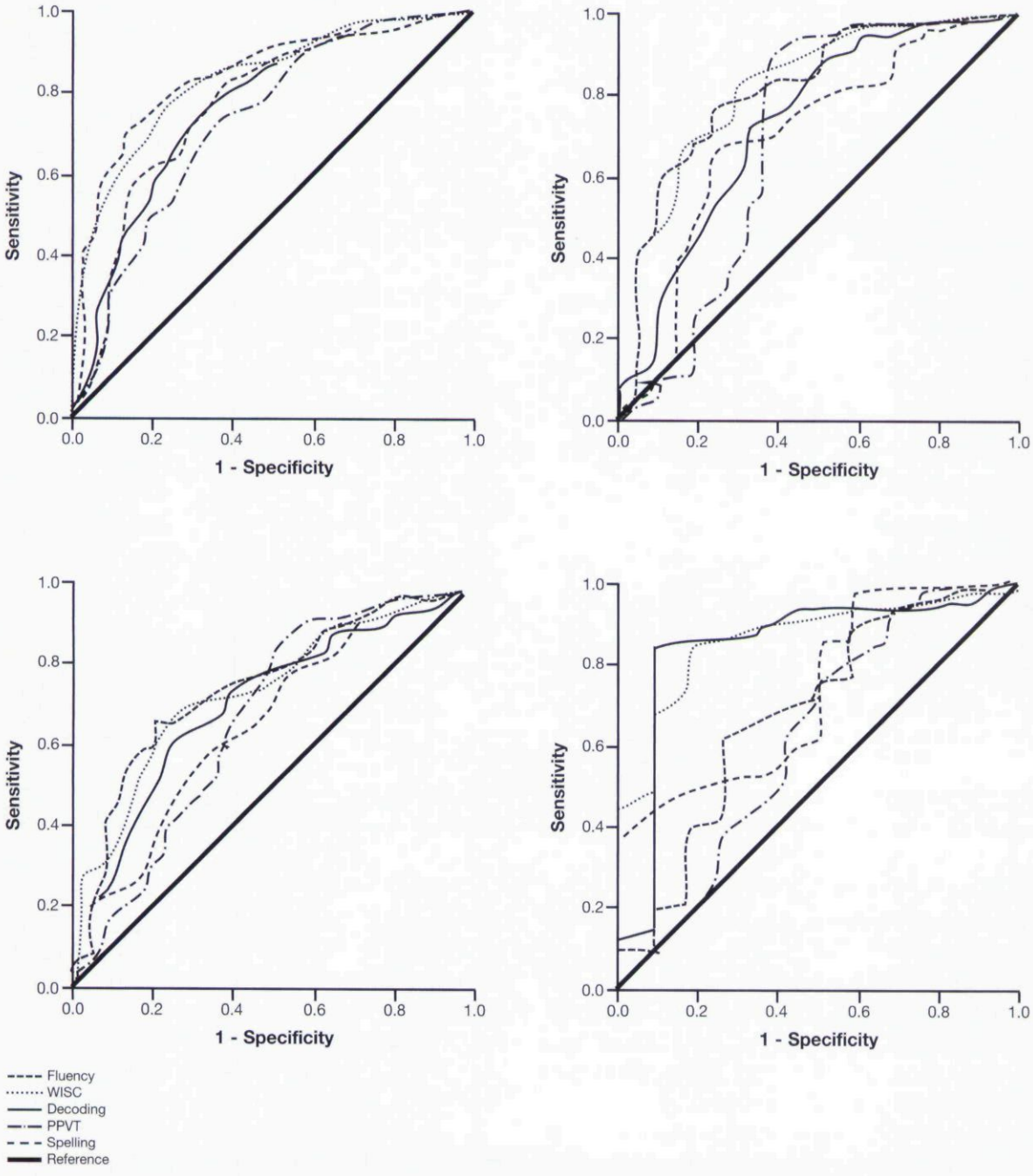


Table 4

Areas Under the Curve (AUC) and Accuracy Indices for Variables in the Full Sample

Variables	AUC	Std. Error	Significance	Sens.[t]	Spec.[t]	PPP[t]	NPP[t]
Word Reading Efficiency	**.729**	.026	.000**	.708	.655	.922	.283
WISC Vocabulary	**.828**	.019	.000**	.740	.805	.956	.352
Reading Accuracy	**.767**	.023	.000*	.788	.644	.927	.346
PPVT	**.831**	.010	.000**	.683	.874	.969	.325
Spelling	**.776**	.023	.000**	.785	.655	.929	.348
Positive Affect	.519	.033	.573	.859	.218	.863	.213
Negative Affect	.526	.034	.438	.865	.241	.867	.239
Efficacy	.527	.033	.417	.892	.172	.861	.217
Challenge	*.568*	.032	.034*	.924	.195	.868	.309
Curiosity	*.571*	.032	.028*	.824	.326	.876	.241
Recognition	.544	.034	.198	.709	.379	.868	.185
Competition	*.590*	.034	.009*	.788	.372	.879	.232
CDI: Negative Mood	.594	.031	.003*	.582	.586	.890	.197
CDI: Ineffectiveness	.504	.034	.902	.948	.126	.861	.297
CDI: Anhedonia	.521	.034	.536	.440	.632	.873	.165
CDI: Negative Self-Esteem	.500	.034	.993	.205	.839	.879	.156
RCM: Physiological Anxiety	.535	.034	.310	.584	.575	.887	.195
RCM: Worry/Oversensitivity	.505	.033	.877	.246	.805	.879	.154
RCM: Social Concerns/Conc.	*.572*	.034	.037*	.537	.598	.884	.184

Note. $*p < .05$ $**p < .001$. [t]sens. = sensitivity, spec. = specificity, PPP = positive predictive power, NPP = negative predictive power. Significant and substantial areas under the curve are shown in bold. Significant areas are shown in italic.

Profiling Student Motivation and Cognition Using Cluster Analysis

An exploratory two-step cluster analysis was run to identify patterns of relationships across linear combinations of variables to determine how students with reading comprehension difficulties are aligned across those patterns (Table 5). The two-step approach was preferred over the hierarchical or the K-means methods because the hierarchical method clusters variables and is used with small samples whereas the K-means method requires a pre-assigned number of clusters (undermining the entire notion of exploration). The log-likelihood distance method was implemented because it is sensitive to deviations from normality in order to aid cluster identification (i.e., the distance between clusters). All analyses were run with standardized variables as required. The number of clusters was determined using Schwartz's Bayesian Criterion (BIC).

Results pointed to the existence of three distinct subgroups of students (see Figures 4 and 5). Clusters 1 and 3 included similar proportions of students with reading comprehension difficulties (about 50%). Both of these

clusters involved students who were low in achievement, but differing on motivation. Cluster 1 consisted of students who were low in motivation, which is why it was termed the "helpless" cluster. This group, mainly students with reading comprehension difficulties, had statistically significantly higher values on depression, anxiety, and negative affect than to the null model. Conversely, Cluster 3 was composed of students who reported high scores in motivation, despite low achievement. Lastly, Cluster 2 was composed mainly of typical students who were high achievers and held below-average levels on motivation variables with the exception of competitiveness, for which they held values well below average.

DISCUSSION

The purpose of the present study was twofold: (a) to assess the discriminatory validity of a wealth of cognitive, motivational, affective, and psychopathological variables for identification of students with reading comprehension difficulties; and (b) to profile students

Figure 3. ROC curves for two CDI scales (anedonia and negative self-esteem) and physiological anxiety (RCMAS) indicating significant accuracy of the three psychopathological measures for identification of students with reading comprehension difficulties in grade 4. The accuracy for all other grades and the full sample was at chance levels.

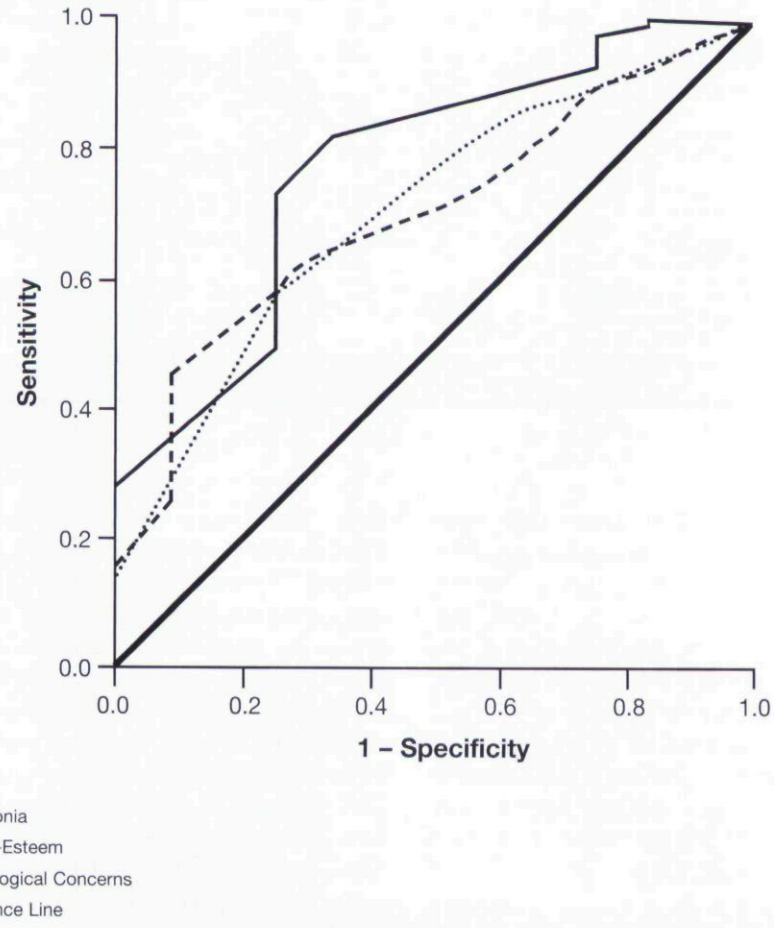


Table 5

Cluster Membership and Individual Variables' Contribution to Each Cluster

	Cluster Grouping					
	Low Achievement Low Motivation		High Achievement Aver. Motivation		Low Achievement High Motivation	
Variables	**Mean**	***SD***	**Mean**	***SD***	**Mean**	***SD***
Efficacy	*-0.91*	1.02	0.02	0.91	**0.56**	0.66
Challenge	*-0.80*	1.03	-0.02	0.94	**0.54**	0.71
Curiosity	*-0.75*	1.08	-0.10	0.95	**0.59**	0.58
Recognition	*-0.29*	1.04	*-0.22*	1.08	**0.55**	0.56
Competition	-0.09	0.90	*-0.33*	1.01	**0.58**	0.83
Positive affect	*-0.35*	1.06	-0.19	0.86	**0.55**	1.01
Negative affect	**0.70**	1.41	-0.11	0.85	*-0.29*	0.69
Depression	**0.45**	0.64	0.16	0.60	*-0.54*	0.55
Anxiety	**0.46**	0.81	0.12	0.71	*-0.50*	0.76
Receptive Vocabulary (PPVT)	*-0.57*	0.90	**0.56**	0.64	*-0.39*	0.93
Spelling	*-0.81*	0.61	**0.69**	0.75	*-0.53*	0.71
Expressive Vocabulary (WISC)	*-0.56*	0.61	**0.59**	0.95	*-0.49*	0.71
Word Reading Efficiency	*-0.82*	0.68	**0.61**	0.77	*-0.49*	0.77
Reading Accuracy	*-0.54*	0.95	**0.53**	0.44	*-0.31*	1.01

Note. 43.8% of the students with RD were assigned to cluster 1 (Helpless Students), 11% in cluster 2 (Non-Competitive High Achievers) and 45.2% in cluster 3 (Motivated Low Achievers). Bold values indicate positive effects above .20 and values in italic negative effects below -.20.

with and without reading comprehension difficulties across those variables. Results indicated that cognitive deficits were mostly responsible for reading comprehension difficulties; a few motivational and psychopathological variables were predictive of group membership when combined with cognitive variables.

Cluster analysis helped determine the relative influence of each variable on identification of students with and without reading problems because it was based on several cognitive, affective, psychopathological, and motivational variables. Specifically, cluster analysis results suggested that students with reading comprehension difficulties present a diverse and conflicting profile with regard to motivation. Thus, motivation did not independently account for much of the between-groups variance towards explaining group membership (with the exception of competitiveness which is discussed later on). Keeping all else constant, however, half of the students with reading comprehension difficulties appeared to be motivated and to have high levels of positive affect and low levels on psychopathology; another half of the at-risk group was lacking the motivation to achieve and had high levels of negative affect and psychopathology. The presence of two subgroups of students with reading comprehension difficulties (either low or high in motivation) explained why motivation was not a significant discriminating variable. If this finding reflects the true state of affairs, then students with comprehension difficulties are low achieving on a number of variables and lack necessary language skills but may be low or high on motivation, affect and psychopathology. Another

Figure 4. Clusters in which variables are aligned in descending order based on importance. The upper panel shows the "helpless" cluster and the bottom panel the "high-achieving" cluster. The dashed vertical lines represent critical values of students' *t*-statistic, so whenever bars cross those lines, it is an indication of a variable's significant contribution to the specific cluster (i.e., observed values exceeded the critical ones).

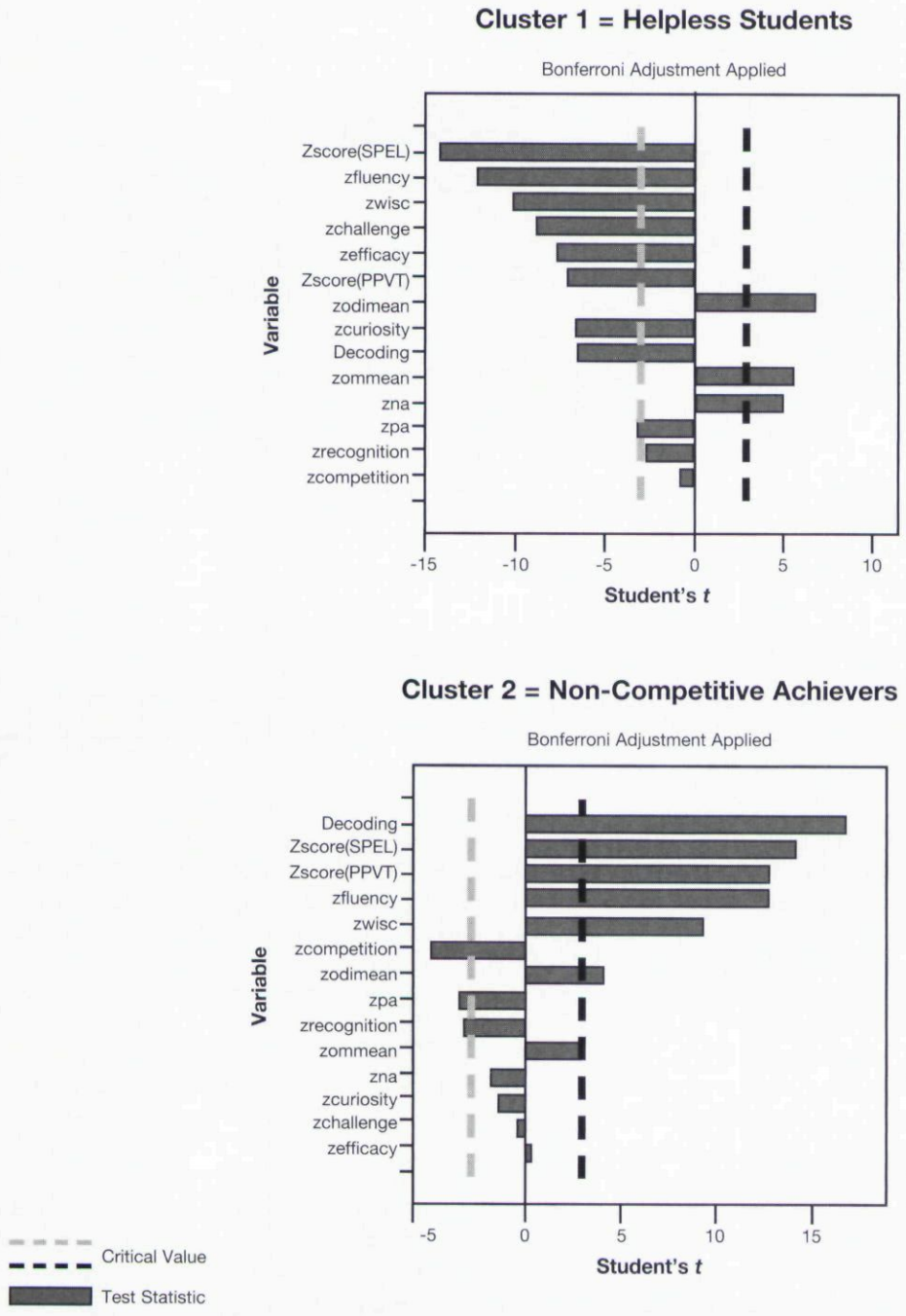
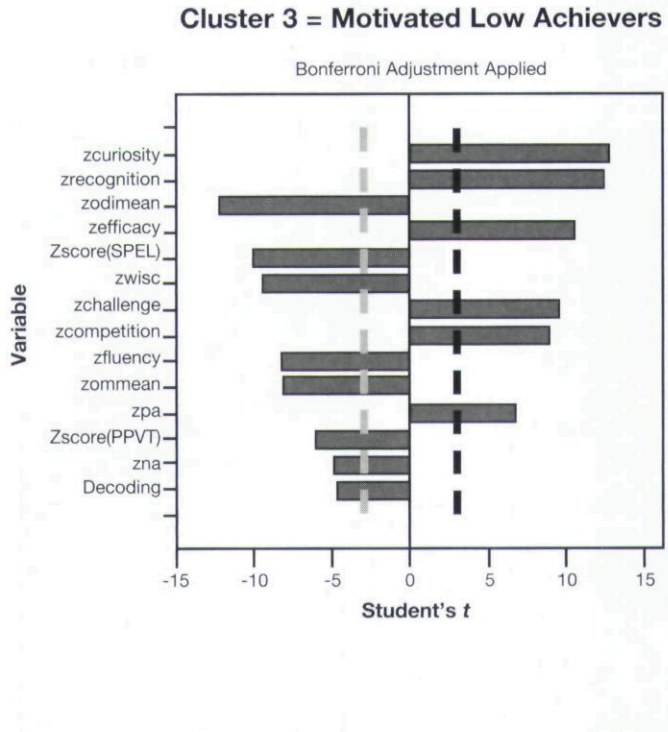


Figure 5. Cluster in which variables are aligned in descending order based on importance. The panel shows the "low-achieving motivated" cluster. The dashed vertical lines represent critical values of students' *t*-statistic, so whenever bars cross those lines, it is an indication of a variable's significant contribution to the specific cluster (i.e., observed values exceeded the critical ones).



explanation may lie in the presence of desirable responding in younger children and the possible bias that has been linked to the assessment of social and motivational constructs. For example, Kistner, Haskett, White, and Robbins (1987) reported that students with LD were accurate in their self-reports but others have reported inflated responding (Bear & Minke, 1996; Clever, Bear, & Juvonen, 1992).

Among motivational constructs, competitiveness was the least adaptive for both group identification or achievement. Striving to outperform classmates appears to be a significant negative predictor of comprehension difficulties group membership. This finding implies that striving to outperform other students may create a set of contingencies that are not conducive to learning. The construct of competitiveness is defined by attempts to compare oneself with normative evaluative criteria and resembles the construct of performance goals in achievement goal theory (Dweck, 1988; Dweck & Leggett, 1988). In the context of goal setting, competitiveness describes purposeful thinking driven by external contingencies and closely resembles "performance goals" that highly value normative comparisons. Individuals pursuing those goals usually find themselves under high stress during difficult tasks, because challenging events trigger a maladaptive set of cognitions directed by the possibility that the person is incapable of performing at adequate or desired levels (Midgely, Kaplan, & Middleton, 2001). Thus, often competitive performance goals are associated with maladaptive cognitions and affect for students with and without learning difficulties (Pintrich et al., 1994; Thomas, & Oldfather, 1997). Nevertheless, adaptive findings with regard to academic achievement have also been reported with both typical students (Harackiewicz, Barron, Pintrich, Elliot,

& Thrash 2002) and students with LD (Sideridis, 2005a).

The finding regarding competitiveness poses a challenge for educators and policy makers because of federal and state mandates such as high-stakes testing in the United States. The latter raises two important issues: (a) should teachers prepare students for normative evaluations? and (b) should teachers employ normative evaluative criteria, given that students will later be required to perform according to those criteria? Teachers are faced with the challenge to prepare students for such assessments, which involve skills (competition) that are also required in later life. Given the negative findings of competitiveness on reading achievement in the present study, it may be reasonable to start thinking of a new model that involves intrapersonal rather than interpersonal standards of success. Employment of such criteria may eliminate the negative effects that public evaluations have on students' motivation and achievement. We suggest incorporating motivational strategies into teaching as several studies corroborate this idea (Garcia & de Caso, in press; Meece & Miller, 2001; Morgan & Fuchs, in press; Pappa, Zafiropoulou, & Metallidou, 2003; Quirk, 2004), but with a focus on enhancing intrinsic motivation and a flow-like experience for all students such as through employing interesting material (McLoyd, 1979; Morrow, 1992).

Although competitiveness proved to be maladaptive in the context of the present study, other researchers have considered competitive goals adaptive (e.g., Harackiewicz et al., 2002), but contrasting views are also present (Brophy, 2005; Midgley et al., 2001). With regard to students with LD, the findings are equivocal in that competitiveness has been linked to both positive (Sideridis, 2005a) and negative achievement outcomes (Pintrich et al., 1994), while null results have also been reported (Sideridis, 2003).

The finding related to competitiveness has clear implications for the design of contexts that are conducive to learning. Teachers should avoid using competitive goal structures with LD students. Although investigation of classroom goal structures is relatively new, several studies have corroborated the idea that performance-oriented climates are maladaptive. For example, Kaplan and Midgley (2000) reported positive effects between a mastery goal structure and positive emotions through adaptive coping. Ryan, Gheen, and Midgley (1998) and Karabenick (2004) showed that performance goal structures are associated with avoiding help-seeking. Sideridis (in press) demonstrated a negative link between performance goal structures and positive affect, perceptions of reinforcement, engagement, and student boredom for students with LD. Further, Linnenbrink (2005) reported positive associations between performance goal structures and achievement, in agreement with the notions of revised goal theory (Harackiewicz et al., 2002). In summary, most of the above findings point to the maladaptiveness of performance goal structures with regard to various student behaviors and achievement. It is, therefore, recommended that teachers emphasize cooperative and intraindividually based learning structures (see Ames, 1992; Brown, 1992; Calfee, 1994; Guthrie & Alao, 1997; Leland & Harste, 1994; Lepper & Hodell, 1989).

With regard to classification, the present findings regarding motivation resemble a previous classification study (Sideridis & Tsorbatzoudis, 2003), which reported high levels of competitive performance goals in the cluster that consisted mostly of students with LD, specifically, students who had high levels of performance and task-avoidant goals, low achievement in math, and low expectations, goals, self-efficacy, and self-regulation. The same students reported high levels of valence and motivational force. Thus, in some respects the third cluster of the Sideridis and Tsorbatzoudis study resembles the third cluster of students in the present study, suggesting again that competitive performance goals are negatively associated with achievement in both reading and math.

Manifestation of psychopathology tendencies did not emerge as a significant predictor of text comprehension difficulties group membership for the entire sample. At first glance, this finding contrasts with previous studies (Heath & Ross, 2000; Maag & Reid, 2006) reporting high levels of anxiety and depression in students with learning disabilities. A possible explanation may be that the present sample of students with reading comprehension difficulties was drawn from the typical population for their low achievement. However, when looking at the effects of those variables across different grades a pattern emerges, suggesting that psychopathology becomes increasingly more prevalent and salient in later grades (grade 4). Thus, it appears that the role of psychopathology in predicting reading comprehension difficulties becomes more salient for older students or that reading comprehension can be predicted at non-chance levels when students' anxiety and depression levels are known.

Similarly to psychopathology, positive and negative affect did not emerge as significant predictors of group membership. Thus, although the effects for positive affect were more pronounced, overall, the results suggested that students' affect did not account for significant amounts of variance in RD group membership. From the cluster analysis it was obvious that negative affect was a characteristic of the "helpless" type,

whereas positive affect was of the motivated, although low-achieving, third cluster. One explanation for the limited contribution of the affective measures may be that the variability due to affect was accounted for by other affect-related measures such as anxiety, depression, or even motivation. Another explanation may be that affect is not specifically related to comprehension, as performance on the subject matter should be more strongly influenced by factors such as concentration and knowledge of the topic, rather than affect. Nevertheless, the finding contrasts with previous studies in which affect emerged as a significant predictor of achievement (Yasutake & Bryan, 1995).

An important finding of the present study relates to the examination and cross-validation of the discriminatory solution across three grade groups, plus the cross-validation samples. Results pointed to a few between-group differences with regard to the measured characteristics. Interesting, the effects of competition, vocabulary, and decoding were most stable for the prediction of reading comprehension difficulties. Other attributes were less stable, suggesting the presence of developmental factors. For example, decoding appears to be less predictive of reading comprehension in grade 4, presumably because students become more proficient and rely less on decoding as they get older. In contrast, spelling was more predictive of RD in later grades, perhaps expressing a Matthew effect for those least able to process texts effectively for meaning. Further, depression seems to have a larger effect in later grades whereas the effects of anxiety seem to level out by grade 3. The remaining attributes were rather inconsistent across grades.

In the future it will be of interest to examine the invariance of the predictors with regard to the age of the participants and to extend the age groups beyond grade 4. In other words, to investigate (a) whether motivation, affect, and psychopathology influence students of different ages differently; (b) whether there is a vulnerability in these areas across age (Vauras, Rauhanummi, Kinnunen, & Lepola, 1999); or (c) whether these predictions are stable across different subject matters (e.g., students with reading/math or other disabilities).

Another venue of research relates to integrating elements from motivation and cognition in developing interventions that would result in students' effective regulation (see Ruban, McCoach, McGuire, & Reis, 2003) of their classroom behaviors (Poskiparta, Niemi, Lepola, Ahtoal, & Laine, 2003; Reutzel, Smith, & Fawson, 2005; Schraw & Bruning, 1999). Such integration may be particularly important given recent evidence favoring motivational interventions that include multiple elements (Morgan & Sideridis, in press; Vauras et al., 1999) such as goals (Sideridis, 2002). Although this may be the ultimate step towards helping students with LD overcome failure (Margalit, 2003), we first need to understand all the attributes of the disorder. Classification studies are a necessary step in that direction.

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NOTES

[1] Receiver Operating Characteristic curves were generated to evaluate the contribution of each individual predictor to accurately classify students as having reading comprehension difficulties. The model, originated in the early 1940s, generates a plot that contrasts false positive rates to true positive rates. The diagonal line on the plot indicates chance classification (i.e., a ratio of 50:50) and the ROC curve is indicative of correct classification. Specifically, the further the ROC curve is from the diagonal, the higher the correct classification rate (Gallop, Crits-Christoph, Muenz, & Tu, 2003; Hsu, 2002). Typical conventions of non-chance classification rates include curves that are 20% or farther from the diagonal (above or below), suggesting correct classification rates of at least 70% of the tested cases. A potentially damaging violation of the curve's assumption is that the test scores used to classify students as having

a disability or not are dependent upon the "gold standard." Violating this assumption may result in overestimation of a variable's discriminant validity (Grilo, Becker, Anez, & McGlashan, 2004). Here, violation of the independence assumption was ruled out because the identification criterion was based on a standardized measure of reading and the students were not classified as having a disability; rather that they formed a subgroup of students with reading deficits, specifically deficits in reading comprehension.

2. Random error can have severe effects on the classification of student cases in ROC curves. The model requires high internal consistency estimates of the measures in order to overcome the problem of chance estimation. In the present study all internal consistency estimates were high; thus, the estimate of the ROC curves can be trusted.

3. In the present study student groups were formed in the absence of a "golden" standard. However, prediction and classification are discussed with regard to groups of students with reading comprehension difficulties rather than students with identified learning disabilities or, specifically, comprehension disabilities. Thus, this potential limitation has been overcome.

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