THE READING CHARACTERISTICS OF GIFTED LITERACY DISABLED STUDENTS

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ABSTRACT

A subset of the corpus of gifted students who have learning difficulties are those who have specific literacy disabilities; gifted literacy disabled (GLitD) students. Estimates suggest that approximately 10 per cent gifted read at a level of two or more years below their expected grade level. Surprisingly then, these students have attracted comparatively little past research interest.

The present investigation examined the reading characteristics of a group of 37 primary level GLitD students aged between 78 and 121 months. These students displayed a discrepancy in literacy performance of at least 1 standard deviation below the mean for their chronological age in at least one of reading prose accuracy, prose reading comprehension or isolated word reading accuracy.
As well, their spelling and phonemic awareness (segmentation and blending) were assessed. Scores on the cognitive factors of the WISC-III identified two groups: a group of 20 students with superior performance (at least 130 points) on both Verbal Comprehension and Perceptual Organisation (the 'superior VC + PO' group) and a group of 17 students with superior performance only on Perceptual Organisation (the 'superior PO' group).

The two groups differed in the literacy patterns displayed. The superior PO group showed the greater level of difficulty, with all measures of literacy at least one standard deviation below their expected score. The superior VC + PO group showed lower performance on isolated word reading and spelling. They did not differ in phonemic awareness.

The literacy disability displayed by both groups is attributed to a specific preference for the use of global rather than analytic information processing strategies. This in turn influences phonemic awareness knowledge and consequently orthographic knowledge. The superior VC + PO group are more able to compensate for this cognitive disability.

The implications of this study for the diagnosis and instruction of GLitD students are discussed.

The existence of gifted students who have learning difficulties has been well documented over the last decade (Brody & Mills, 1997; Dix & Schafer, 1996; Ellston, 1993; Fetzer, 2000; Hishinuma & Tadaki, 1996; Rivera, Murdock, & Sexton, 1995). These students display a learning capacity that is characteristic of students who are gifted, in parallel with academic performance that is substantially below what would be expected based on their intellectual ability.

They display comparative underachievement in areas such as reading, spelling and mathematics. The low achievement can be due to a range of causes, for example, attention deficit hyperactivity disorder (Leroux & Levitt-Perlman, 2000), motivational / emotional / behavioural sources (Morrison, 2001) or socioeconomic status or culture (Dole, 2000). In some cases, the cause is not immediately obvious but is attributed to a 'processing deficit' (Brody & Mills, 1997), a concept that has often been only vaguely defined (McCoach, Kehle, Bray & Siegle, 2001). The present study examined a subset of this latter group; gifted students who have literacy learning disabilities (GLitD students).

While the existence of literacy learning disabilities by some gifted students has frequently been noted, they have attracted little empirical analysis. Literacy disabilities include impairments in reading and writing and occur in a range of combinations. It is estimated that about 10 per cent of high IQ children read two or more years below their grade level and 30% show a discrepancy between their mental age and reading achievement (Little, 2001; Winner, 1996). While

the more general category of GLD has elicited interest, earlier investigations have not examined specific underlying cognitive correlates for GLitD students, characteristics in their reading patterns of these students or the causes of the literacy underachievement.

To diagnose the learning needs of this group and to implement effective instruction, educators and diagnosticians need to understand the causes of literacy learning disabilities. It is possible that each area of academic disability may be characterised by a slightly different cause. An issue that confronts investigators in this area is the possibility of categories of gifted literacy disability, as in the study of dyslexia generally.

A CONTEMPORARY MODEL OF LITERACY PROCESSING

To provide a foundation for examining the literacy disabilities of gifted learners, it is useful to review contemporary models of reading and spelling. Reading can be characterised as an information processing activity in which readers identify various types of information: words, sentences, conceptual relationships and the topic of the text. As they read, the readers integrate the outcomes of processing at these levels and form an overall impression of the 'just read' text that they match against their 'macrostructure' representation of portion of the text they have read so far and their expectations of what the text might mention in the future. This process is referred to as multiple-level text processing (Hacker, 1997; Hacker, 1998a; Kinnunen & Vauras, 1995).

Processing at each level requires access to particular types of knowledge. Underpinning reading is a reader's conceptual knowledge, seen as networks of linked meanings organised into topics. During reading, part of these networks are stimulated or activated and these provide the basis for comprehension.

Readers identify words and comprehend sentences by matching letter strings in a text with representations they have stored of how words are written and said and what they mean. The grammar of written sentences is matched with links the reader has formed between concepts. A reader may have additional conceptual links that are not specified in a text. These provide the basis for predicting and expecting reference to other ideas. The topic of the text matches part of a reader's network of meanings.

A reader's comprehension of the text at any time is the sum of the processing at the various levels. Information gained at the various levels is compared and synthesised. Readers process texts at the various levels simultaneously rather than in a sequential way. This is described as parallel processing and occurs when readers can use their knowledge at each level in a relatively automatic way.

As well as this knowledge, readers have access to strategies that they use when the text they are reading doesn't match exactly their knowledge. These strategies allow them to link the text with what they know by acting both on text units and on what they know. They link unfamiliar letter clusters with words they know either by using letter sound recoding or by analogy procedures. They deal with unfamiliar sentence forms by parsing, reading aloud, re-reading or visualising the sentence.

Reading disabilities arise due to inadequate knowledge and strategies at each text level. Inadequate written word knowledge, referred to as dyslexia, can be due to a range of processes: phonological and phonemic processing, orthographic processes, semantic processing or rapid retrieval of names from long term memory (Compton, 2002; Metsala, 1999; Siegel, Share & Geva, 1995). . Inadequate sentence level knowledge can be due to poor knowledge of written grammar, slower semantic retrieval or semantic Organisation (Siegel & Ryan, 1988). Inadequate conceptual and topic level knowledge can also be due to lower semantic retrieval or semantic Organisation

Spelling difficulties are attributed to similar causes. Inadequate phonological and phonemic processes, semantic processing, the rapid retrieval of letter sounds and names and grammatical knowledge influence the recall of a spelling pattern.

DESCRIBING GENERAL ABILITY

An approach to the description of the knowledge of these students has been in terms of general ability assessments. General ability assessments such as the Wechsler Intelligence Scale for Children III (Wechsler, 1992) and the Stanford-Binet Intelligence Scale : Fourth Edition (Thorndike, Hagen & Sattler, 1986) evaluate various aspects of knowledge. Of these, the various editions of the Wechsler Intelligence Scale for Children have been used most frequently for the description of the general ability of both gifted and learning disabled students. Various indices are calculated to describe performance on this scale: (1) general ability score, (2) a score for the verbal and nonverbal or performance areas, and (3) a set of scores that measure four information processing factors (Carroll, 1993; Keith & Witta, 1997; Prifitera & Weiss, 1993): Verbal Comprehension, Perceptual Organisation, Freedom from Distractibility and Processing Speed.

Comparison of the factor scores is frequently seen as more useful for analysing patterns in learning (Keith & Witta, 1997) than the total general ability score or comparing verbal and performance scores. A procedure for comparing the factors is provided by Sattler (1998). For students who have reading difficulties, their Perceptual Organisation score may be a better estimate of their general cognitive functioning than their Verbal Comprehension score, because of past reading difficulties (Kaufman, 1994).

The WISC III factors that cause greatest difficulty for many students who have reading difficulty are Freedom from Distractibility and Processing Speed (Daley & Nagle, 1996; Sattler, 1988). These comprise the subtests Arithmetic, Digit Span, Symbol Search and Coding. Together with Information, diagnosticians have integrated these into 'profiles' or patterns of scores to describe students who have learning disabilities. Four main profiles have been identified, each labelled by an acronym that contains the first letter of the subtests it comprises: ACID (Arithmetic, Coding, Digit Span), ACIDS (Arithmetic, Coding, Information, Digit Span, Symbol Search), SCAD (Symbol Search, Coding, Arithmetic, Digit Span) and CAD (Coding, Arithmetic and Digit Span).

The portion of the reading disability population who show the ACID and CAD profiles varies between studies, usually between 30 % and 50 % (Gutkin, 1979; Prifitera & Dersh, 1993; Young & Mollner, 1995). The profiles are not unique to students who have reading disabilities. They have been displayed by students who have other learning disabilities and by those who have ADHD. This has led some diagnosticians to question their predictive value for students who have reading difficulties. While a profile

suggests the possibility of a reading difficulty, it is not sufficient to diagnose a reading difficulty (Prifitera & Dersh, 1993; McCoach, Kehle & Bray, 2001; Sattler, 1988; Ward, Ward, Hatt, Young & Mollner, 1995).

An alternative approach to describing cognitive profiles has been provided within the cognitive style perspective. The analytic - global dimension of cognitive style has been used in a plethora of studies (see Riding & Cheema, 1991 for a review). It is generally agreed that the acquisition of early literacy knowledge requires the use of analytic sequential learning strategies (Rasinski, 1984; Truch, 1993).

THE KNOWLEDGE OF GIFTED STUDENTS

The conceptual networks of gifted and talented students are seen as more differentiated with richer sets of conceptual links. They are "able to conceptualize quickly, to see patterns and relationships readily, to reason abstractly, to generalize easily and to enjoy the challenge of autonomously solving novel problems" (Barton & Starnes, 1989, p. 28).

In terms of WISC III factors, one would expect higher performance on at least one of Verbal Comprehension and Perceptual Organisation. Given the breadth of the constructs of giftedness and learning disabilities, it is unlikely that a single pattern of scores could identify all gifted literacy disabled students. The little reported research available supports the existence of three groups: superior knowledge in one of Verbal Comprehension and Perceptual Organisation and superior knowledge in both. Evidence for these groups needs to be take account of the observation that the WISC-III profiles of gifted/learning disabled students show higher discrepancies (of more than 15 points between Verbal and Performance scores) than those of students who demonstrate giftedness alone (Brody & Mills, 1997; Ferri, Gregg & Heggoy, 1997).

Available analyses support these groups. A group with a higher Perceptual Organisation score is consistent with Silverman's (1989) 'gifted visual-spatial' learning profile. Groups characterised by a superior Verbal Comprehension score that is either higher than or not different from the Perceptual Organisation score have also been reported (Barton & Starnes, 1989; McCoach, Kehle, Bray & Siegle, 2001). These students show high Comprehension and Similarities scores (Barton & Starnes, 1988; Baum, Owen & Dixon, 1991; Ferri, Gregg & Heggoy, 1997); they have extensive vocabularies, well-developed conceptual abilities, a large general knowledge (Little, 2001), good listening comprehension and express themselves well (Hishinuma & Tadaki, 1996). They reason abstractly, solve problems and may show a sophisticated sense of humor (Rivera, Murdock & Sexton, 1995).

Most investigators agree, however, that the gifted learning disabled group is more likely to show lower performance on the Freedom from Distractibility and Processing Speed factors. These students may show weaknesses in subtests that require attention, concentration and sequencing skills, such as Arithmetic, Digit Span and Coding, that is, versions of the ACID type profile mentioned earlier. These profiles suggest comparative difficulties on tasks

that require using information in a particular sequence, retaining arbitrary information in order and manipulating symbolic information. They display a tendency to learn globally (Brody & Mills, 1997; Little, 2001; McCoach, et.al, 2001). Their difficulties centre on basic automatic skills as graphomotor speed, perceptual scanning, sequencing and organisation (Barton & Starnes, 1989)

In the student population at large, those showing this characteristic learning profile have generally been referred to as the global language deficit group or the 'basic phonological processing disorder' group (Rourke, 1998). Readers operate less analytically and in more global, gestalt ways, have difficulty with verbal associations and verbal sequencing (Leton, Myomoto & Ryckman, 1987) and exhibit restricted auditory memory both short- and long-term verbal memory. They often show phonological and recoding difficulties in reading and spelling and difficulties with grammar.

DESCRIBING THE CAUSE OF THE LITERACY LEARNING DISABILITY

As noted earlier, a literacy learning disability can be attributed to inadequate knowledge and strategies at any of the levels of text processing noted earlier. Evidence of a processing deficit is used to assist in distinguishing gifted literacy disability from other causes of under-achievement, such as poor motivation (Brody & Mills, 1997). This notion has been only vaguely defined in the literature, limiting the identification of the implications of these difficulties for gifted/LD students (McCoach, Kehle, Bray & Siegle, 2001).

Synthesising the model of literacy learning and the superior knowledge of gifted students above, one might intuit that the processing deficit may be due to cognitive or metacognitive processes that permit the acquisition of knowledge at each level of text.

The capacities measured by ACID-type profiles might be expected to be most closely linked with letter cluster learning. Digit Span performance is mediated by phonological processes similar in nature to those involved in phonemic awareness (Baddeley, 1986; 1990). Coding and Symbol Search performance measure the ability to learn an arbitrary visual-spatial code in a way similar to learning letter-sound relationships.

Readers who display ACID-type profiles might, therefore, be expected to have difficulty learning to read and to spell words automatically. Difficulties displayed by these readers in analysing words to produce sounds and with phonics, rote memorisation and Organisation (Brody & Mills, 1997) are consistent with this expectation.

It should be noted that while one might intuitively expect gifted literacy disabled students to display phonological awareness difficulties, it is not reasonable to assume that gifted students generally show difficulties in this area. McBride-Chang, Manis and Wagner (1996) reported that grade 3-4 students identified as gifted achieved a higher score on phoneme segmentation, deletion and sound position analysis than did students in the average reasoning range. These investigators did not distinguish between reading disabled from the able reading gifted students. It should be noted that the students in this study might reasonably be expected to have completed their acquisition of this capacity. They were older than those usually assumed to be in the course of acquisition of phonological awareness knowledge

Verbal Comprehension scores in the superior range and an ACID type profile suggest access to the verbal knowledge necessary to support reading in parallel with possible difficulty learning and using letter cluster knowledge. When reading tasks aloud, these students may be expected to display a higher reading comprehension than word reading accuracy. Their superior verbal conceptual knowledge will adequately support reading comprehension and they need to read accurately only a small portion of the text to represent the text they are reading. In other words, a highly elaborated and differentiated verbal conceptual network may compensate for lower word reading accuracy.

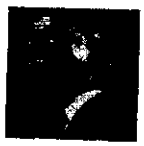
Verbal Comprehension scores in the average range and an ACID type profile, on the other hand, may be expected to be linked with both lower reading accuracy and comprehension. A less elaborated and differentiated verbal conceptual network may not compensate to the same extent for lower word reading accuracy.

Variation in Verbal Comprehension leads to differences in the comprehension of word meanings and the relationships between meanings, the richness of semantic networks and in the repertoire of thinking strategies that permit comprehension. One might expect, for example, that the GLitD students with superior Verbal Comprehension might interpret text differently from their peers with more average verbal ability: for example, they might link ideas by semantic inference more effectively and not need to process the written data to the same extent. Advanced imagery knowledge, on the other hand, might lead to a different interpretation of the text.

As a consequence, one might predict a greater discrepancy between measures of word accuracy and comprehension for familiar contexts for GLitD students with superior Verbal Comprehension than for their GLitD peers with average Verbal Comprehension; their reading comprehension for texts that have a familiar context might be less influenced by poor word recognition.

The observation that these readers use metacognitive strategies in ways more like their gifted peers than their average learning peers, for example, engaging in comprehension monitoring, (Hannah & Shore, 1995; McGuire & Yewchuk, 1996), while differing in their use of 'while reading' such as visualising and paraphrasing and planning strategies is consistent with this interpretation. These studies did not examine other aspects of literacy processing. It is possible that the students were less efficient in detecting errors because their learning disability restricted their ability to read words efficiently. While their metacognitive knowledge may have been adequate, their knowledge of print units may have restricted their application of the while reading strategies.

It would seem intuitively reasonable to assume that word reading proficiency is learnt in the same ways regardless of whether or not the individual is gifted and that the causes of reading disability for those who are gifted are in essence not different from those for other students. While the letter cluster patterns displayed by learners may be qualitatively similar to those displayed by non-gifted reading



disabled learners, this similarity may not extend to other aspects of reading.

If such qualitative similarity can be detected, it would seem reasonable to expect that the causes of reading disability are, in essence, not different. As noted earlier, difficulties in two areas are associated with impoverished orthographic knowledge; a range of phonological abilities and orthographic analogy processes. In particular, difficulties in the segmentation of spoken words into sounds, phonemic awareness and the use of the common features shared between two or more written words are likely to impact on orthographic learning.

The focus of the present investigation is on how gifted learning disabled students use their superior knowledge (verbal and / or nonverbal) during literacy activities. It examines

(1) the predicted factor profiles of gifted literacy disabled primary level students, both in terms of the differences between Perceptual Organisation and Verbal Comprehension and the extent of ACID-type profiles;

(2) the predicted reading accuracy and comprehension patterns associated with each Perceptual Organisation -Verbal Comprehension pattern; GLitD students who display superior scores in both Perceptual Organisation and Verbal Comprehension are predicted to show a greater discrepancy in reading comprehension-accuracy than those who display a superior score only in Perceptual Organisation; and

(3) the predicted relationship between lower ACID-type scores and (a) isolated word reading and spelling and (b) phonemic awareness.

METHOD

Participants

The participants were 37 primary age students referred from schools in metropolitan Melbourne for a psycho-educational assessment because of literacy learning difficulties. Their mean age was 101 months, with a standard deviation of 13 months. Ages ranged from 78 months to 121 months. Of the sample, 65 % of the referrals were initiated by the students' teachers. The participants were selected from a larger group of primary level students according to a number of criteria specified below.

Assessment procedures

Students' performance in the following areas was assessed using the procedures specified:

(1) Prose reading accuracy and prose reading comprehension were assessed using the Neale Analysis of Reading Ability 3 Form 1 (Neale, 1999). Each student's reading performance in each area was expressed as a standard z score.

(2) Individual word reading ability was assessed using the Reading Recognition subtest of the Peabody Individual Achievement Test - Revised (Markwardt, 1997). Participants heard a set of words, one at a time and wrote each one in turn. The words were frequently occurring and ranged from one to five syllables in length. The presentation of the words was not timed. Each student's literacy performance was expressed as a standard z score.

(3) Spelling ability was assessed using Spelling : From beginnings to independence (Fryar, 1997). Participants heard a set of words, one at a time and wrote each one in turn. The words were frequently

occurring and ranged from one to five syllables in length. The presentation of the words was not timed. Each student's performance was expressed as a deviation spelling score (chronological age - spelling age).

(4) Phonemic awareness was assessed using *Assessing and Teaching Phonological Knowledge* (Munro, 1999). Participants completed the Phonemic Segmentation and Phonemic Blending tasks. For Phonemic Segmentation participants heard one syllable words of sound length from three to six phonemes and said, in order, the sounds in each. For Phonemic Blending, participants heard a sequence of from three to six phonemes and blended them into a word. Performance in each area was described in terms of phonemic span and as a standard z score.

(5) General ability was assessed using the Wechsler Intelligence Scale for Children III (Wechsler, 1992) . The full battery of subtests was administered and the 'scaled' score for each sub-scale and the four 'factor' scores were calculated for each participant. Performance on this set of tasks was used to compute, for each learner
   (1) the four factor scores
   (2) the ACID profile
   (3) the cognitive style or global index using the procedure recommended by Letteri (1987). The following 'global' index was calculated : Picture Completion + Block Design + Object Assembly - Picture Arrangement -Coding - Symbol Search. An index value greater than 5 indicated a global preference and a value less than -5 suggested an analytic preference.

(6) Participants' creative ability was rated by their teachers using the Checklist for Identifying Creative Children (Sattler, 1988). This checklist rates students on 36 behaviours identified by Amabile as indicative of creativity.

(7) Participants' display of indicative behaviours of gifted learning disability was rated using a checklist entitled *Indicative Behaviours of Gifted Learning Disability*. The indicative behaviours were compiled from descriptions of the characteristics of these students by McEachern and Bornot , (2001), Ferri, Gregg and Heggoy (1997) and Dix and Schafer, (1996) and each was rated on a 5 point scale in terms of the comparative frequency of each behaviour. The indicative behaviours were rated by teachers. Items targeted the following areas of learning behaviours:

- preference for whole-part learning strategies, synthesise ideas well rather than stepwise
- see the big picture; not detail oriented
- recall non literacy knowledge well from long-term memory
- generate their own methods of organisation in topics of interest
- develop own methods of problem solving in topics of interest
- solve problems intuitively
- learn better through immersion than through being programmed through drill and repetition
- learn better in untimed situations
- generate unusual solutions to problems, have very interesting ideas
- develop quite asynchronously, may uneven scores patterns
- perform better with more challenging work , prefer complexity
- reason well in topics of interest.
- extremely curious, asks many questions about topics of interest
- are intrinsically motivated in areas of interest, have high degree of energy
- perceptive and insightful (seems "wise").

Procedure

The participants were selected according to a number of criteria

(1) each had an intelligence quotient of at least 130 points on either or both the Perceptual Organisation or Verbal Comprehension factors on the WISC III.

(2) each displayed a discrepancy in literacy performance of at least 1 standard deviation below the mean for their chronological age in at least one of the following areas of literacy; reading prose accuracy, prose reading comprehension or isolated word reading accuracy. This is the criterion recommended by Brody & Mills (1997), Marsh and Wolfe (1999) and Mendaglio (1993).

(3) each received a mean rating exceeding 4 on the Checklist for Identifying Creative Children (Sattler, 1988) and on the Indicative behaviours of gifted learning disability.

Following selection, participants were categorised according to differences in general ability scores between the two factors Verbal Comprehension and Perceptual Organisation. The criterion used for difference in the factors was that recommended by Sattler (1998), a difference of at least 12 for a .95 probability level. Sattler (1998) provides the exact data for each comparison. (Table C-2, page 814). Three categories were available:

(1) a group in which Perceptual Organisation and Verbal Comprehension scores differed by less than 12, the 'superior VC + PO' group.

(2) a group in which the Perceptual Organisation score exceeded the Verbal Comprehension score by at least 12, the 'superior PO' group.

(3) a group in which the Verbal Comprehension score exceeded the Perceptual Organisation score by at least 12, the 'superior VC' group.

The prose and individual word reading patterns, spelling ability and phonemic awareness of each group were compared, using MANOVA procedures and the comparison of mean scores.

RESULTS

The cohort of participants was categorised into two groups on the basis of difference between the factor scores for Verbal Comprehension and Perceptual Organisation; a superior Perceptual Organisation category (superior PO) and group for which both the Verbal Comprehension and Perceptual Organisation scores did not differ (superior VC + PO group). No participant displayed higher Verbal Comprehension over Perceptual Organisation. In all, 54 % of the cohort were in the superior VC + PO group.

The broad cognitive 'demographics' of the two groups were described in terms of their scores on the four factors. The mean score and standard deviation for each category and the extent of difference between the groups (2 tailed t-test for independent samples) are shown in Table 1.

These data support the categorisation of the cohort; the two groups differ in measures of verbal but not nonverbal or performance ability. The two groups also differ on the Freedom from Distractibility index; the superior VC + PO group achieved a higher score. The data support two of the profiles reported earlier for gifted learning disabled students (Barton & Starnes, 1989; McCoach, Kehle, Bray & Siegle, 2001). A group for which the Verbal Comprehension score is higher than the Perceptual Organisation score did not emerge.

To examine these trends further, the score of the two groups on each subtest was compared. The mean scaled score for each subtest (maximum = 19) and standard deviation for each category of gifted student and the extent to which they differ (2 tailed t-test for independent samples) are shown in Table 2.

These data indicate that while the group with superior Verbal Comprehension scores generally achieved a higher score on verbal but not on performance tasks, the two groups did not differ on the Information sub-test or on Digit Span ($p > .05$) . The Information task assesses the ability to remember general knowledge facts and to use verbal general knowledge to explain phenomena. The comparisons for the verbal tasks supports the interpretation that while the two categories are equally able to learn verbal knowledge, they differ in their ability to reason about it. As well, they differed on Block Design ($p < .05$), with the group with Verbal Comprehension scores in the average range achieving a higher score.

The group with Verbal Comprehension scores in the superior range displayed higher retrieval of word meanings. The two groups did not differ in the number of items answered but did differ in the quality of their responses. The group with Verbal Comprehension scores in the average range was more likely to define words with reference to specific contexts while their peers provided more abstract, decontextualised definitions. Similar outcomes were noted for Similarities and Comprehension.

Table 1: The mean score and standard deviation for each category of students on each factor and the extent of difference between them (t value).

	superior PO group (n = 17)	superior VC + PO group (n = 20)	t-test (df = 35)
Verbal Comprehension	105.8 16.5	125.7 9.5	3.08 **
Perceptual Organisation	129.6 7.0	125.0 7.6	-1.22
Freedom from Distractibility	92.3 10.7	108.7 15.6	2.25 *
Processing Speed	103.8 16.5	98.9 16.2	.97

* $p < .05$ ** $p < .01$

The difference between the two groups on Freedom from Distractibility can be attributed to differences in Arithmetic. The two groups did not differ in their Digit Span score.

Both groups displayed the ACID profile; the discrepancy indices for the superior PO group and the superior VC + PO group being 3.6 and 3.2 respectively. On the analytic - global dimension of cognitive style, the global indices for the superior PO group and the superior VC + PO group were 7.6 and 7.2 respectively.

The standard literacy scores (prose reading accuracy, prose reading comprehension, individual word reading accuracy and spelling accuracy) were computed for each GLitD profile. The influence of GLitD profile on each literacy score was examined using MANOVA procedures. The mean reading scores (z scores) and the mean deviation spelling score (chronological age - spelling age) for each profile are shown with the relevant univariate F values and individual univariate t values (.95 confidence intervals) in Table 3.

The level of literacy performance depended on the group. The superior

Table 2: The mean score and standard deviation for each category of students on each WISC III subtest and the extent of difference between them (t value).

	superior PO group (n = 17)	superior VC+PO group (n = 20)	t-test (df = 35)
Information	12.2 4.2	13.8 2.3	1.01
Similarities	12.0 3.1	16.4 2.6	3.03 **
Arithmetic	9.0 2.8	13.6 2.6	3.33 **
Vocabulary	10.3 1.9	13.5 2.5	2.67 *
Comprehension	9.3 4.8	14.3 2.4	2.78 *
Digit Span	8.0 2.1	9.1 3.8	.64
Picture Completion	15.5 2.0	13.9 2.0	-1.57
Coding	10.3 2.3	8.9 4.0	-.80
Picture Arrangement	13.8 2.3	14.2 1.9	1.30
Block Design	16.0 2.4	13.5 2.3	-2.37 *
Object Assembly	15.0 2.2	14.6 2.5	-.32
Symbol Search	10.9 2.7	10.6 3.1	-.43

* $p < .05$ ** $p < .01$

PO group showed the greater level of difficulty, with all measures of literacy at least one standard deviation below their expected score, based on their grade level. The superior VC + PO group showed lower performance on isolated word reading and spelling.

The two groups did not differ in prose comprehension. They did, however, differ on the measures of word level reading; in isolated reading accuracy and in prose reading accuracy and also in spelling ability ($p < .05$). This suggests that the group with Verbal Comprehension scores in the superior range had better developed orthographic knowledge than the group with Verbal Comprehension scores in the average range.

The two groups also differed in the patterns they displayed between the three reading scores:

(1) the superior PO group showed higher prose comprehension than prose word reading accuracy ($t(16) = -2.40$, $p < .05$) and reading accuracy for prose and isolated words at a similar level ($p > .05$).

(2) the superior VC + PO group displayed prose comprehension and prose reading accuracy at a similar level ($p > .05$) and reading accuracy for prose higher than isolated word reading accuracy ($t(19) = -2.31$, $p < .05$).

A major cause of word reading disabilities is phonemic awareness. The mean span scores for phonemic segmentation and blending, the mean z score and the difference between the two groups on each measure (t-value for independent samples) are shown in Table 4.

These data indicate that both groups showed immature phonemic development in both segmentation and blending. A segmentation span of approximately 4.5 indicates a severe difficulty learning letter cluster patterns of more than five sounds (Munro, 1999). As well, the two groups did not differ in either segmenting or blending ability ($p > .05$).

Table 3: The mean score and standard deviation for each category of students on each measure of literacy and the extent of difference between them (univariate F, t value).

z score	superior PO group (n = 17)		superior VC + PO group (n = 20)		univariate F (1,36)	t-test (df = 35)
prose reading accuracy	-1.49	.40	-0.43	.37	8.46 **	2.91 **
prose reading comprehension	-0.90	.65	-0.29	.48	4.31	1.38
individual word reading accuracy	-1.76	.45	-0.65	.53	6.42 *	2.67 *
#spelling deviation score	-29.66	12.09	-12.33	10.87		2.28 *

* $p < .05$, ** $p < .01$.

The spelling score is not a z score but a discrepancy or deviation score.

DISCUSSION

Taken together, the data in Tables 2 and 3 suggest that while the two groups differed in their level of verbal reasoning, their comprehension of word meanings and the relationships between meanings and in their repertoire of thinking strategies that permit comprehension, this did not contribute to differences in reading comprehension. The predicted claim of a higher reading comprehension performance over prose word reading accuracy for the group with superior knowledge in both verbal and nonverbal areas was not supported by the data. The expectation that their superior Verbal Comprehension would allow them to interpret text differently from peers with more average verbal ability was not supported.

It is possible that the reading comprehension tasks used did not permit the emergence of advanced ways of verbal thinking. A characteristic of gifted knowledge and reasoning is the capacity for far transfer of ideas. The tasks used to assess reading comprehension in the present study did

not discriminate between those items intended to assess inferential versus literal comprehension. Of the 28 comprehension questions for the four easiest texts, five at most could be judged to assess other than literal comprehension. It is possible, therefore, that the tasks did not provide optimal opportunity for the display of gifted literacy knowledge.

As noted, the two groups differed in the trends between reading comprehension and accuracy. This finding is counter to the prediction that the superior VC + PO group show a greater discrepancy in reading comprehension-accuracy than those who display a superior score only in Perceptual Organisation. The data suggest that both groups accessed their verbal conceptual knowledge with similar facility and differed in their use of letter cluster knowledge.

This interpretation is supported by comparing word reading accuracy under the various conditions for each group. The superior VC + PO group read words more accurately in prose than when isolated ($p < .05$), while for the superior PO group, the two conditions did not differ. This difference could be due either to better developed orthographic knowledge or to the extent to which the existing verbal knowledge of each reader scaffolded the reading accuracy. This was examined by investigating whether the difference between the two groups in prose reading accuracy remained when the influence of word reading accuracy was removed. Analysis of covariance procedures indicated that this difference between the two

Table 4: The mean span scores for phonemic segmentation and blending for each group and the matching z score.

phonemic task	superior PO group (n = 17)			superior VC + PO group (n=20)			t test (df = 35)
	mean span score		z score	mean span score		z score	
phonemic segmentation	4.66	1.36	- 1.74	4.50	1.069	- 1.83	-.26
phonemic blending	4.66	1.50	- 2.18	5.25	.707	- 1.43	.97

categories did not remain (p>.05). This suggests that the difference in word reading accuracy during prose is attributed to differences in orthographic knowledge rather than to differences in a verbal knowledge of context that scaffolds the reading accuracy.

These data are consistent with the claim that for both groups of GLitD readers, the component of literacy knowledge that was least well developed was their letter cluster or orthographic knowledge. Of the two groups this was lower for those with superior nonverbal knowledge and average verbal knowledge. The highly elaborated and differentiated verbal conceptual network knowledge of the GLitD group with superior Verbal Comprehension scores seemed to compensate for lower letter cluster knowledge and led to higher prose word reading accuracy.

The claim that the group with superior knowledge in both verbal and nonverbal areas had better developed letter cluster knowledge is supported by a comparison of spelling accuracy for the two profiles. This group achieved a higher spelling score, even through their mean spelling accuracy age was approximately one year below their chronological age.

Difficulties in learning letter cluster knowledge and spelling patterns were predicted to be associated with the ACID - type profiles. For the superior VC + PO group the ACID profile emerged, due to comparatively lower scores on Coding and Digit Span. The superior PO group also showed the ACID profile, but due to lower scores on Arithmetic and Digit Span. The ACID scores for the two groups are lower comparatively because of the higher scores on the remaining subtests.

In terms of a preference on the analytic - global dimension of cognitive style (Letteri, 1987), the emergence of a positive global index for both GLitD groups suggests a reduced tendency to process information in analytic sequential ways. The importance of this processing strategy for early literacy acquisition has already been noted. These findings provide empirical evidence for the claim that gifted learning disabled students generally are more likely to show comparative difficulties on tasks that require using information in a particular sequence, retaining arbitrary information in order and manipulating symbolic information and a tendency to learn globally (Brody & Mills, 1997; Little, 2001; McCoach, et.al, 2001). Students showing this learning profile generally have been referred to as the 'basic phonological processing disorder' group (Rourke,

1998). They have difficulty with verbal associations and verbal sequencing (Leton, Myomoto & Ryckman, 1987).

Consistent with a lower tendency to use analytic sequential processing strategies, both groups showed delayed phonological awareness knowledge. Their difficulty learning letter cluster knowledge is explained, at least in part, by this. Such a finding runs counter to the finding by McBride-Chang, Manis and Wagner (1996) that grade 3-4 students identified as gifted achieved a higher score on phoneme segmentation, deletion and sound position analysis than did students in the average reasoning range.

The present findings do not indicate definitively an explanation for the difference in letter cluster knowledge between the two GLitD groups. For the texts read, the two GLitD groups did not differ either in reading comprehension or in phonemic awareness knowledge. While both groups showed lower letter cluster knowledge, the superior PO group showed lower letter cluster knowledge. One can only speculate on the cause of this difference.

Given that the two groups have similar phonemic knowledge, it is possible that the word level reading difference is due in part to variation in earlier exposure to text. The frequency of exposure to written text influences word reading accuracy independently of phonemic knowledge (Cunningham & Stanovich, 1998; McBride-Chang, Manis, Seidenberg, Custodio & Doi, 1993). It is possible that the GLitD students with superior Verbal Comprehension were more able to engage in early reading and to develop a positive self efficacy as a reader than those whose Verbal Comprehension was lower. As a consequence, they may have had a more frequent early exposure to text. An outcome of more frequent reading is that one's existing knowledge is increasingly programmed in more linguistic type ways that match the organisation of concepts in text and that in turn, facilitate subsequent reading. Future research may examine whether early reading habits influence differences between the two groups

The findings of the present study assist in clarifying the nature of the processing deficit that underpins gifted literacy disability. It is an analytic sequential processing difficulty that influences the acquisition of sub-word phonological and phonemic knowledge necessary to build an effective knowledge of letter cluster patterns. The global processing preference may also influence the specific types of metacognitive knowledge students learn and the

influence of these on early literacy learning. This processing preference is likely to lead to difficulties in learning to analyse words to produce sounds and to phonics difficulties.

The use of metacognitive strategies by these students while reading has already been noted (Hannah & Shore, 1995; McGuire & Yewchuk, 1996). Metacognitive processes are domain specific. Metacognitive strategies for manipulating verbal information differ from those used to manipulate nonverbal imagery knowledge. It is possible that the two groups in the present study, while engaging the same types of metacognitive strategies, differ in their knowledge of each strategy and the extent to which they use them to compensate for word level reading difficulties.

This knowledge can be used at three phases during reading; the initial linking of existing knowledge with the text, the on-going alignment of knowledge during meaning construction while reading and the post reading consolidation and synthesis of what has been read. It is possible that the GLitD students with superior Verbal Comprehension were more proficient in these areas. This would account for their ability to read words in prose more accurately than when presented in isolation or when required to spell words.

These findings raise the possibility that the two GLitD categories may display literacy learning disabilities for slightly different reasons. While the data in Table 2 indicate that they do not differ on either the Digit Span or Coding sub-tests, the synthesis of differences in Verbal Comprehension with comparatively lower ACID profiles may contribute to variations in the capacity to acquire orthographic knowledge.

IMPLICATIONS FOR TEACHING

The findings of the present investigation have direct implications for the education of students who are both gifted and have specific literacy disabilities. First, they indicate yet again the existence of students whose general ability is superior in various areas and who have difficulty learning to be literate. Second, they indicate that these students differ in their general learning ability and therefore in the entry knowledge they bring to the literacy learning context. They suggest that these students may differ in the causes and reasons for their literacy learning difficulty.

Third, the findings also suggest the need for the identification of trends in literacy performance when these students have their reading capacity diagnosed. Teachers need to be aware of those students who have access to superior verbal or nonverbal knowledge. Diagnostic procedures need to pinpoint those aspects of reading that are in place and those that may be accounting for the difficulty.

Fourth, they identify the need for differential instruction that targets the specific literacy learning needs of each student. Students who are able to comprehend text adequately but who have difficulty with word level reading accuracy need different instructional support from those who have difficulties in both accuracy and comprehension areas. Subsequent studies may examine the value of teaching students who display superior Perceptual Organisation knowledge to recode their knowledge to a verbal form prior to reading. It is possible that the recoded knowledge can better scaffold reading.

Fifth, and perhaps most important, the literacy teaching program needs to ensure that the student's superior knowledge is recognised and valued. Many GLitD students report that their areas of gifted knowledge are often ignored in instructional support programs. Teachers need to ensure that these students perceive that their knowledge is appropriately recognised and valued.

CONCLUSION

The present study has identified groups of students who are both gifted learners and have literacy learning disabilities. These students are prevented from using their superior knowledge to comprehend and reason about content they read by their difficulty learning to read words relatively automatically. They have access to average or above average networks of verbal concepts but are restricted in using these to maximum advantage because they cannot identify the verbal concepts effectively. Many of these students are highly talented and have the potential to contribute substantially to the creative and innovative capital of their cultures. While they continue to experience literacy learning disabilities, the likelihood that they will have the opportunity to make such contribution is low.

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