STIMULATING BASIC RECALL IN HYPERLEXIC STUDENTS USING THE VISUALIZING/VERBALIZING PROGRAM

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The information for this study was compiled in 1996 from data that was collected in the time period 1990-1993. Since then, the "Auditory Discrimination in Depth Program" has been re-named the "Lindamood Phoneme Seqeuncing Program."

I have also since modified the Gray Oral Reading Test (GORT) to include a scale which attempts to informally measure the degree of mental imagery the student is experiencing.

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July, 2004

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Abstract

Reading disabilities can be broadly grouped into those which affect decoding and encoding and those which affect comprehension. Difficulties with decoding and spelling have long been recognized as learning disabilities. There is a rich history of research on dyslexia. However, difficulties with comprehension in the absence of decoding difficulties have not received as much attention. In this paper, the concept of "hyperlexia" is discussed using Paivio's dual-coding theory as a theoretical foundation. An analysis of the short-term effectiveness of using Nanci Bell's visualization and verbalization (V/V) program on the recall of 66 "hyperlexic" subjects is also presented. Highly significant gains ($p<.0001$) in cued recall were found for subjects after 80 hours of treatment. The data was covaried for age and vocabulary. Age had a significant effect on treatment results ($p<.007$) while vocabulary did not reach a significant level ($p<.07$).

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BACKGROUND

Broadly speaking, fluent reading is a complex interaction of the two major processes of decoding and comprehension. Disruptions to either of these processes can have serious consequences for the learner. In The Missing Parts of Whole Language, (Truch, 1990), I presented the following schematic to illustrate this interaction and the categories suggested by it:

Figure 1

Classification of Reading Problems

		Comprehend? Yes	No
Decode?	Yes	#1 (Goodreader)	#2 (Hyperlexic)
	No	#3 (Dyslexic)	#4 (Both)

In terms of the third quadrant, (individuals with good comprehension but weak decoding) a considerable body of research done in the last 15 years clearly demonstrates the

importance of phonological processing in the early acquisition of decoding and encoding (Adams, 1990) and its causal role in that process (Bradley and Bryant, 1983; Wagner and Torgesen, 1987; Torgesen, Wagner and Rashotte, 1994; Torgesen, 1997). In addition, a number of studies have been conducted which demonstrate the effectiveness of early stimulation in phonological processing as a means of stimulating decoding/encoding and preventing reading disabilities (Blachman, 1991; Bradley and Bryant, 1985; Bradley, 1987; Lundberg, Frost and Peterson, 1988; Torgesen, 1997) while other studies have demonstrated the effectiveness of stimulating phonological processing in populations of disabled readers (Truch, 1991, 1994).

Terms like "dyslexia" have been used to describe students with specific reading disabilities in word recognition. In fact, the 1994 revised definition of "dyslexia" states it is a phonologically-based reading disorder.

In the classroom and clinically, students with this type of processing difficulty are easy to identify simply because their symptoms are obvious and usually appear at an eary age. For example, a student who struggles with the decoding process in grade 1 will often exhibit obvious frustration in addition to being unable to sound out or spell unfamliar words. This frustration is the motivation for the teacher and/or parent to take some action. This usually leads to referrals to school specialists who then do assessments, place the student in an appropriate setting, write an IEP and then deliver the service. In the absence of the school taking such action, parents will often take the matter in their own hands and hire a tutor, do a private assessment, etc. again, in the hopes of relieving the child's obvious difficulties.

However, it has also been a common experience of teachers and clinicians that some students seem to have difficulty specific to the comprehension process that is not due to poor word recognition or word attack skills. It is easy to understand why reading

comprehension might be weak for the dyslexic student. So much in the way of processing time is spent in trying to identify a specific word(s) in a passage that understanding it becomes secondary. However, if the burden of decoding is taken away and the passage is read to the dyslexic student, then the student displays a full understanding of the information by being able to answer recall questions as well as make higher-order inferences.

But what about the student who displays the opposite pattern? These are the individuals from quadrant #2 in Figure 1. How do we explain the student who is able to read a passage fluently but seems to have very little recollection of what was just read? Such a student seems to have a reading style where words "go in one ear and out the other," so to speak. In addition, when the passage is read to the student, the difficulty with comprehension remains. The student is unable to recall the information or seems to have organized it in an inconsistent and confusing manner.

While there have been occasional references in the research to this kind of reading difficulty (for example, Patrick Groff has used the term "hyperlexic" to describe it), the pattern is much more difficult to identify as a reading disability (and I would argue that it is as much a disability as is dyslexia). As a result, very little research has been done on this population, the reasons for it are not as well known and appropriate treatments and courses of action are less likely to occur.

Indeed, in the years prior to starting a reading clinic, I was a practicing school psychologist. If a reading specialist found a student with the "hyperlexic" pattern, the case was usually turned over to me, since it was not perceived as being a reading problem.

Indeed, after reviewing the data, I usually invoked explanations that were more in the

behavioral/affective domain than in the reading domain (for example, a "lack of motivation" or a "lack of interest" on the part of the student). In retrospect, it is easier to see that I was dealing with a "chicken and egg" question. Such students often do seem to lack motivation and interest, but I am now convinced that their processing difficulty causes the lack of motivation in the first place. Another frequently used explanation is a "weak language base" or a weak "experiential base," but traditional one-word measures such as the Peabody Picture Vocabulary Test and the Wechsler Intelligence Scale usually ruled out a weak language-base as the primary cause of the comprehension difficulties. And many of the students who displayed this pattern had as rich a home-environment as other students in the class.

In the end, the kinds of suggestions made to help alleviate the problem involved the use of some reading comprehension strategies and some behavioral ones. For example, parents and teachers were told to have the student re-read the passage, underline key words, find the main idea, etc. They were also told the student needed more structure and self-discipline and were left with suggestions for developing good study skills and habits perhaps in combination with an incentive program of some kind. While all these approaches could provide some degree of relief, long-term follow-up showed that the pattern was often a pervasive one with no significant change in the presenting symptoms often over a period of years.

These traditional approaches have become more sophisticated over time. For example, a number of strategies based on whole-language philosophy have been adopted across classrooms in North America (eg. pre-discussions, semantic webbing and mapping, setting a purpose for reading, reciprocal teaching, use of picture cues, use of contextual prediction, etc.). These strategies are designed to stimulate prior knowledge in most cases and their purpose is to have the reader actively involved in the comprehension of text and the construction of meaning.

The effectiveness of some of these practices continues to be researched but the number of studies using students from disabled populations is more limited. And the number of studies involving populations of "hyperlexic" students is even more limited again.

Most of current comprehension research and practice is driven by schema theory, which hypothesizes that representations of knowledge are made in memory in abstract structures called schemata (Anderson and Pearson, 1984).

A theoretical alternative to schema theory which I have found particularly effective in helping to explain "hyperlexia" is Paivio's "dual-coding" theory (Paivio, 1990). Paivio says that human experiences can be stored or "coded" in one of two ways—either through the verbal system or through the non-verbal system. Storage in the verbal system involves the construction of "logogens" (these might be similar to schemata) while in the non-verbal system, storage involves the construction of "imogens". Paivio posits that comprehension is greatly enhanced when information is stored simultaneously in both systems ("dual-coded"). The systems are inter-connected and therefore experiences can be stored in just one system or the other or "cross-referenced," so to speak.

The complexity of these systems and their interactions make it possible for information to be used in cognitive tasks in general and in the guidance of human behaviour. Sadoski, Paivio and Goetz (1991) reviewed and evaluated the key research on schema theory. They argue that dual-coding theory provides a more consistent and parsimonious explanation of the results of schema research and the results of imagery and affect studies in reading research. Indeed, a strong case can be made for the importance of imagery processing to oral and written language and comprehension and cognition in general (see Kosslyn, 1994 for a thorough review of 20 years of research in this area).

In terms of reading disabled populations, disruptions to either the verbal or the non-verbal representational system or their interactions causes problems in oral language processing (Bell, 1991) and leads to a pattern of reading called "word-calling" or, in this paper, "hyperlexia." The pattern of "word-calling" can be characterized in the following way: the student can decode (and spell) effectively but has little understanding of the material. Thus the student has difficulty extracting or creating meaning from print. Unfortunately, the same difficulty appears when information is presented orally. Because the student does not process information orally presented s/he "forgets" the information quickly and indeed often presents as being distractible and disorganized. (thus, there is some overlap with one of the core characteristics of "attention deficit disorder"). The student often becomes very frustrated because so little information is processed. The student may also come to believe that s/he is "stupid."

Under these conditions, the reader can hardly become "engaged with the text." Subsequent re-readings are usually only marginally helpful and studying and learning often become very difficult. Higher-order thinking is thwarted.

According to dual-coding theory and to Bell (1991), individuals who fail to visualize (create imogens) or who visualize but have difficulty expressing their imogens (turning imogens back into language) will show a disruption in the comprehension of oral or written language and will have difficulty expressing their thoughts coherently either verbally or in writing (it is important to understand that these processing problems are separate from any difficulty the student might also have with decoding/encoding).

Some research has been done which shows improvement in basic recall can occur when school-aged children are encouraged to use mental imagery (Gambrell and Jawitz, 1993). Students in grade 4 were randomly assigned to one of four treatment conditions

and asked to (1) attend to text illustrations and induce their own mental imagery, or (2) attend to text illustration only, or (3) induce their own mental imagery (with no text illustrations provided) or (4) try to remember the story. Students read the narrative passage and were then asked questions under conditions of free and cued recall. Results showed that the first treatment (illustrations plus imagery) produced superior results under all recall conditions. Imagery only was generally better than either illustrations only or the last condition of just trying to remember. The latter in fact, produced results markedly weaker than any of the other conditions.

However, encouraging a student to "make a picture" for what s/he is reading will be difficult if the student cannot create the imagery in the first place. Indeed, our clinical experience indicates that some students seem to have great difficulty generating images at all. Such students often require a very intensive remedial program in order to stimulate dual-coding.

One very specific and detailed program intended to stimulate dual-coding is called Visualizing and Verbalizing (V/V). The specific steps in this program are described by Bell (1991). Bell's V/V Program is used in a number of clinics across North America, including The Reading Foundation, in Calgary, Alberta.

Bell (1991) provides statistical data that shows significant gains on some measures of comprehension including the GORT-R, the Nelson Denny and the Descriptive Tests of Language Skills of the College Board, Reading Comprehension subtest, all of which measure aspects of higher-order thinking processes as well as basic recall.

This study, though not a controlled study, is meant to provide additional and primarily descriptive statistical data about clients who undertake remedial work in "visualizing and verbalizing" based largely on Bell's methods and procedures.

In summary then, reading disabilities encompass disabilities associated with either decoding and/or comprehension (Truch, 1991; 1993). The basis of the decoding problem lies at the phonological level of speech (Stanovich, 1988). The basis of a comprehension dysfunction ("word-calling" or "hyperlexia") can be seen from the perspective of dual-coding theory as the inability to link language with mental imagery and/or the inability to recode those images back into language in an appropriate fashion. Decoding and comprehension can be stimulated by intensive (but separate) remediation that works at a more basic processing level in each case (in the case of decoding/ encoding, at the phonological level and in the case of comprehension, at the imagery level).

Method

Subjects for this analysis were drawn from an over-all client pool of 348 individuals. This pool represents 95% of the total clients seen at The Reading Foundation from its opening in July of 1990 to three years later. Subjects were of different ages and ability levels. Overall, 60% of them were in the age-group 6-12; another 25% were from ages 13-17 and the remaining 15% were adults aged 18 and over. No attempt was made in the initial diagnosis to classify subjects into various disabling categories but the vast majority of them would meet traditional criteria for "learning disabled" (ie., average intelligence or better but with a discrepancy between reading potential and performance) or "dyslexic". Some of the subjects would be classified as "slow learners" or "mentally challenged." A few subjects also suffered brain injury as a result of accidents or trauma. Some would also meet the criteria for "attention deficit disorder." All of them complained of some difficulty in the reading, spelling or writing areas or with learning in general. Clients were first screened on a standard battery of tests used at the clinic which included:

(1) The Lindamood Auditory Conceptualization Test (LAC) (Lindamood and Lindamood, 1979) as a measure of phonological processing (2) An informal sound-to-symbol test developed at the Lindamood-Bell clinic (SS Test) as a measure of "phonics" connections; (3) a "pure" decoding sample obtained from the Word Attack subtest of the Woodcock Reading Mastery Tests (Woodcock, 1973) as a measure of decoding; (4) the Reading subtest from the Wide Range Achievement Test-Revised (WRAT-R) (Jastak and Wilkinson, 1984) as a measure of word identification; (5) the Spelling subtest from the WRAT-R as a measure of spelling ability and (6) the old Gray Oral Reading Test (GORT) (Gray, 1963) as a measure of both decoding and comprehension (basic recall). While the GORT has been updated to the GORT-R and now the GORT-3, the original version provides a nice dichotomy between decoding (as a measure of errors x speed) and comprehension (measured by 4 cued-recall questions for each paragraph). In addition to formal testing on the GORT, "image checks" were done. Since it is impossible to directly determine if someone is "making pictures" when s/he reads, the only way to find out is to ask. So if a student was asked if s/he made images and the reply was "yes," the individual was queried further. For example, if a student were to read the sentence: "In the winter time, the cat was in the back yard," and was asked to describe the picture s/he made and the reply was: "I see a cat in the yard and it's winter," this reply would be insufficient evidence of an "imogen," since all the student did was reword what was read. However, if the student replied with something like: "Well, I see a big yard bordered with fir trees that are covered in snow. The house is a big two-storey one and it's white. I also see a swing set in the back yard and this garden with a black and white tabby cat digging around in it," then that would be evidence of a well-developed and very complete "imogen." Many students with "hyperlexia" could "just remember" some of the information in a passage but the imogens they described (if they made them at all) would often be very incomplete and usually captured just a small portion of the overall information in the text. "Image checks" unfortunately were not

quantified in any way but occurred informally during every assessment, both pre and post.

As a measure of vocabulary, the Peabody Picture Vocabulary Test-Revised (PPVT-R) (Dunn and Dunn, 1981) was administered and/or the Vocabulary subtest from the WISC-R, (Wechsler, 1974) the WISC-III (Wechsler, 1991) or the WAIS-R (Wechsler, 1981) with supplemental subtests administered as needed. In many cases, the full Wechsler Scale had already been administered. Both age and vocabulary became co-variates in this analysis.

In addition, many clients had additional testing from other agencies which provided good background information. Supplemental testing at the clinic to further assess certain hypotheses was also done as needed. The standard battery was then administered at the end of 80 hours of programming as a measure of time-gains. The pre and post-test scores from the standard battery are the ones used in this statistical analysis.

If clients entered the educational therapy programs, they were treated in either the Auditory Discrimination in Depth (ADD) Program (Lindamood and Lindamood, 1975) for decoding/encoding problems (when phonological processing was the primary issue) or the V/V Program (Bell, 1991) when "word-calling" and related comprehension difficulties were the primary issues. Some students did require and received a combination of the two programs, but they do not form part of the analysis presented here.

The vast majority of subjects attended for four hours daily, five days a week, for four consecutive weeks either in the mornings or afternoons. Clinically, this intensive regime has been found to be the most effective one for the delivery of these programs. The cooperation of the school was encouraged when students had to miss any class time and generally, this was given. Many of the subjects however, did attend in the

summer period, when missing school was not an issue. Some adults were not able to attend the clinic in this fashion so scheduling in some cases was not quite as intense.

The youngest subject to attend the clinic was 5 years old. The oldest was 55. The average age of the students in the ADD Program was 12 years. An analysis of pre and post-test effects for the 281 clients who received ADD stimulation has been published elsewhere (Truch, 1994).

The average age of those students who were enrolled in the VV Program was 21 years. This population of students would be primarily "hyperlexic" as described above i.e, their central difficulty was a failure to create images when reading or listening. By contrast, their decoding/encoding skills were intact.

The ratio of male to female clients for the overall population of 348 clients was 2.19 to 1 (239 males and 104 females); The ratio of male to female clients of the hyperlexic variety in the VV Program was 1.68 to 1 (37 males and 22 females).

From the total client pool, there were 69 clients who received the V/V stimulation only and 66 of these were included in this analysis. The other 3 subjects, for personal reasons, declined to be post-tested despite the apparent gains they had made. All 66 subjects could be described as hyperlexic.

General Description of the Therapy Program

All clinicians at The Reading Foundation were trained initially by Pat Lindamood and the author, who himself was trained at the Lindamood-Bell clinic in San Luis Obispo. Advanced training for clinicians was also provided with follow-up visits from consultants from the Lindamood-Bell clinic. This training is essential to the success of the

programs.

All students follow a different therapy sequence for each of the programs, but modifications are made in special cases and adjustments are always made for individual differences.

The clinical teaching method is one of "guided discovery" (as opposed to a direct: "No, that's wrong, this is correct" approach) and "responding to the response" is an integral part of handling errors when a student makes them. "Skill and drill" and negative feedback are greatly minimized as the students are paced through various tasks. Progress is carefully monitored throughout.

The Visualizing/Verbalizing (V/V) Program

The V/V program as developed by Nanci Bell (Bell, 1991a) forms the backbone of the comprehension program used at The Reading Foundation to treat hyperlexia. Students are taught how to connect visual imagery to language in a sequenced series of steps as follows: (1) Picture to Picture. Here the student is presented with pictures and is then asked to describe them using "structure words" of what, size, colour, number, shape, where, movement, mood, background, perspective, when and sound. The objective is to have the student develop fluent verbalizing of a real image. Again, "responding to the response" is an integral part of error-handling in the V/V program. "Choice and contrast" questions are used to stimulate appropriate verbalizing and thinking. (2) Word Imaging. In this step, the student describes his/her own internal images for familiar, high-imagery words in order to develop both the imogen in the first place and then to describe it to someone (structure words are used to assist this). (3) Sentence Imaging. The clinician creates a simple sentence and the student images and verbalizes. (4) Sentence by Sentence Imaging. The clinician assists the student in the

creation of images for paragraphs of longer duration. The process starts receptively (clinician reads to the student) and moves to an expressive mode (student reads him/herself). The student places a coloured square on the table once s/he has an image for the sentence. Once the paragraph is completed, the student is asked for a "picture summary" and then a "word summary". (5) Sentence by Sentence with Interpretation. At this level, higher-order thinking skills can be stimulated since the individual, by this time, is making clearer internal "gestalts" or "imogens" for the information that is being listened to or read. (6) Multiple Sentence Imaging, Paragraph Imaging, Paragraph by Paragraph Imaging. The student is now challenged with information that is both longer and denser. Extensions and overlaps into writing and note-taking take place as appropriate for the individual's needs and processing ability.

It should be noted that most of the reading material used in the treatment regime is expository, rather than narrative in nature.

Results

A total of 66 subjects completed at least 80 hours of V/V therapy.

A univariate analysis of variance was performed (this work was done by Dr. Tak Fung of the University of Calgary using the BMPD Statistical Software program) where the comprehension score on the GORT was the dependent variable. The comprehension score was recorded as a grade-equivalent score. The pre-test grade score was the maximum grade level at which the student scored 75% or more on the GORT comprehension questions (3/4 correct) before dropping below that level. The post-test score was determined in a similar fashion. Comprehension questions on the GORT are of the cued-recall variety. Each passage contains 4 questions. Higher-order processing is not sampled so the results measure basic recall of information only. In most cases,

Form A of the GORT was used on the pre-test and Form B on the post-test.

Table I shows the results of this analysis.

Table I

Effect of V/V Therapy on GORT Comprehension

					Covariables	
Pre	**Post**	**MS**	**F**	**Significance**	**Age**	**Vocabulary**
4.07	**8.53**	**113.52**	**18.73**	**.0000**	**.007**	**.07**

As evident from Table I, the gains in comprehension scores on the GORT are highly significant. The average gain is over four years. The older the clients, the stronger the gains. Vocabulary does not quite reach a level of significance in terms of being an influencing covariable. However, the small number of subjects in some of the categories precludes generalizing the influence of these covariates.

Table II shows the degree of gain (in years on the GORT) for the clients:

Table II

Degree of Gains in Recall

Degree	Number of Subjects
No gain	6
1-2 years gain	10
3-4 years gain	16
5-6 years gain	17
7-8 years gain	9
8-12 years gain	8

While the influence of vocabulary as a covariate failed to reach statistical significance, readers may nevertheless be interested in the following information:

Table III

Gains by Vocabulary Level

PPVT-R Score	N	Average Gain	No Gain
Below 60	1	1.0	0
60-79	3	2.75	0
80-89	11	4.45	1
90-109	42	4.64	4
110-120	7	5.14	1
120+	1	4.0	0

(Of the six subjects who showed "no gain," Table IV shows that five were in the age range 10-15 years and had vocabulary scores (Table III) that were in the average range. Some of these students had adequate recall scores on the GORT on the pre-test because they were able to "just remember" the information. Therefore, the recall score on the GORT might not have changed whereas the student actually shifted his/her strategy from just "remembering" to "dual-coding." "Image checks" verified this, but as mentioned, were unfortunately not quantified in any way.

And since age was an influencing covariable, Table IV provides more details:

Table IV

Gains by Age

Age	N	Average Gain	Showing No Gain
Up to Age 10	1	3.0	0
Age 10-15	25	2.84	5
Age 16-21	21	5.42	0
Age 22-29	6	5.50	0
Age 30-39	6	5.83	0
Age 40-49	6	6.16	1
Age 50+	1	6.0	0

The GORT is a poor measure of "comprehension" since it measures basic recall only. The comprehension questions on the GORT sample basic recall for the most part, and in a few instances, the main idea. It therefore is not evident from the GORT scores alone whether or not any "higher-order" processing is being affected.

Discussion

The results of this analysis indicate that the Visualizing and Verbalizing Program, developed by Bell (1991a) appears to be effective in stimulating basic recall for information just read. This analysis is consistent with Bell's previous work (1991) and provides replication of that work from another, independent clinic. The results are also consistent with the theoretical framework provided by dual-coding theory.

The effect of "visualizing and verbalizing on other "higher-order" aspects of comprehension is unknown from either study.

Limitations of this study are serious ones. They include the self-selecting nature of the subjects and the lack of determining any long-term effect. In addition, subjects were not randomly assigned to different treatment conditions to determine the effectiveness of the V/V Program compared to 80 hours of something else.

Additionally, we have a single-measure of comprehension only, namely responses to recall questions on the GORT. There is no measure which directly taps into the creation of images (image checks were not quantified). Very little in the way of "higher-order" processing is measured and there is much stimulation of language processing in general in the V/V program. Finally, because most of the subjects in this analysis are older, the effect of V/V on younger students (below age 10) remains unknown. Future studies could address those issues.

The primary purpose of this paper however, was not to present a well-controlled re-

search study. This is a very difficult thing to do when working in a clinical setting. (The descriptive data provided on these subjects should be taken as just that.) Rather, the purpose was to identify a specific type of reading disability not commonly recognized in research (hyperlexia), to provide a theoretical framework for this kind of reading disability and to stimulate further discussion and research.

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Figure 1

Classification of Reading Problems

		Comprehend?	
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