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ABSTRACT

A study explored the effects of bimodal (concurrent auditory and visual stimulus modes) versus unimodal reading on 8 poor readers between the ages of 9 and 12 years. An alternating treatments design was used to compare student performance on 12 passages, 45 in each of 3 presentations modes: bimodal, visual, and auditory. Session measures included spontaneous recall, comprehension questions, short-term sight word recognition, and subject perceptions of sessions. Results of both statistical and single-subject data analyses suggest that the bimodal format significantly facilitated the students' abilities to spontaneously recall and comprehend the information presented. Also, sight word recognition showed a significant increase across all conditions; however, no specific bimodal benefits resulted. Session perception measures resulted in significantly higher scores for the bimodal format and qualitative responses found that all but one subject preferred the bimodal format. Individual differences in treatment effectiveness were noted, suggesting that group findings ought to be supplemented with single-subject analysis. (Contains six references and four unnumbered tables of data.) (Author/RS)

The Effectiveness of Bimodal Text Presentation for Poor Readers

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ABSTRACT

This study explored the effects of bimodal versus unimodal reading on eight poor readers between the ages of 9 and 12 years. An alternating treatments design was used to compare student performance on twelve passages, four in each of three presentation modes: bimodal, visual, and auditory. Session measures included spontaneous recall, comprehension questions, short-term sight word recognition, and subject perceptions of sessions. Results of both statistical and single-subject data analyses suggest that the bimodal format significantly facilitated the students' abilities to spontaneously recall and comprehend the information presented. Also, sight word recognition showed a significant increase across all conditions; however, no specific bimodal benefits resulted. Session perception measures resulted in significantly higher scores for the bimodal format and qualitative responses found that all but one subject preferred the bimodal format. Individual differences in treatment effectiveness were noted, suggesting that group findings ought to be supplemented with single-subject analysis.

INTRODUCTION

"Bimodal" refers to the presentation of information using concurrent auditory and visual stimulus modes. This technique has been found to enhance performance in a variety of areas, including response time and accuracy, short-term memory, and even semantic processing. Previous studies have also found that the use of bimodal presentation has resulted in increased student performance on word recognition and comprehension tasks.

- Reitsma (1988) and Wise et. al. (1989) found that students with reading disabilities significantly improved their word recognition skills following extended practice with computerized text which included the option of verbal feedback for unfamiliar words.
- Olofsson (1992) and Che Kan Leong (1992) found that late-elementary and middle school students with reading disabilities exhibited improved reading comprehension when working with computers with verbal feedback options.
- Elkind, Cohen, & Murray (1993) found that continuous bimodal instruction via a computer increased reading comprehension by an average of 1.2 Grade Equivalents on the Gary Oral Reading Test for 70% of their 5th and 6th grade dyslexic students.
- Montali and Lewandowski (in press) found that Junior High students with learning disabilities performed best on a passage comprehension measure with the bimodal presentation compared to either auditory or visual presentations alone. Their performance under the bimodal condition was not different from the performance of average reading peers under the visual (traditional reading) condition.

The goal of this study was to explore individual differences in the effectiveness of bimodal compared to unimodal presentations of text over 12 sessions for 8 special needs elementary students who were poor readers. It was hypothesized that the bimodal presentation of material would increase the poor reader's comprehension of story information as compared with either visual and auditory modes of presentation.

PARTICIPANTS

#	AGE	SEX	ETHNIC BKGD.	HANDICAPPING CONDITIONS	SDRT[1] Phon. Anal.	SDRT[2] Comp Total	IQ SCORE[3]
1	10	M	WHITE	LD/ED/ADHD[4]	1%	2%	116 (a)
2	9	M	WHITE	ED/LD[4]	38%	13%	115 (a)
3	12	M	WHITE	LD/ADHD[4]	57%	23%	90 (d)
4	9	M	WHITE	LD/ED	4%	8%	86 (a)
5	9	F	WHITE	LD/ED/ADHD[4]	20%	30%	106 (b)
6	9	M	WHITE	LD/ED/ADHD[4]	38%	8%	106 (c)
7	11	M	HISP.	LD/ED	1%	N/A	112 (a)
8	11	M	AF. AM.	LD/ED	N/A	N/A	87 (d)

[1] Stanford Diagnostic Reading Test percentile score for Phonetic Analysis subtest from 10/93 administration.

[2] Stanford Diagnostic Reading Test percentile score for Comprehension Total from 10/93 administration.

[3] Full Scale or Composite scores from the following IQ measures: a= WISC-R, b= SBIV, c=K-ABC. d= WISC-III

[4] Medications were prescribed for ADHD for 4 students and depression for one.

MEANS AND STANDARD DEVIATIONS OF SESSION MEASURES

RANGES	SPONT. RECALL (0 - 100 % recall)		COMP. QUESTIONS (0-10 correct)		WORD RECOG. DIFFERENCES (0-10 words)		SESSION PERCEPTION (0 = poor, 9 = good)	
	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
AUDITORY	**31.94**	**17.07**	6.28	1.41	0.97	0.54	6.78	1.22
BIMODAL	**36.91**	**15.25**	**7.43**	**1.13**	1.81	0.74	**7.69**	**1.02**
VISUAL	21.03	14.33	4.97	1.99	1.00	0.48	6.25	1.63

- SPONTANEOUS RECALL: Bimodal condition > Visual condition ($p \leq .017$)
  Auditory condition > Visual condition ($p \leq .017$)
  COMPREHENSION QUESTIONS: Bimodal condition > Visual & Auditory conditions ($p \leq .017$)
- WORD RECOGNITION DIFFERENCES: no significant differences found
- SESSION PERCEPTION: Bimodal condition > Visual & Auditory conditions ($p \leq .017$)

INDIVIDUAL DIFFERENCES IN PERCENTAGE OF NONOVERLAPPING DATA POINTS

	Spontaneous Recall	Comprehension Questions	Word Recog. Differences
Participant #1			
B:A	25	**75**	**100**
B:V	**100**	**100**	**75**
A:V	**100**	**100**	0
Participant #2			
B:A	0	50	25
B:V	75	**75**	**0**
A:V	**75**	50	25
Participant #3			
B:A	25	25	25
B:V	**75**	0	50
A:V	0	**0**	25
Participant #4			
B:A	**100**	**100**	50
B:V	**75**	**100**	0
A:V	0	**0**	50
Participant #5			
B:A	50	50	25
B:V	25	0	0
A:V	0	0	25
Participant #6			
B:A	**100**	0	0
B:V	**75**	50	**0**
A:V	50	**75**	25
Participant #7			
B:A	0	**75**	25
B:V	**100**	**75**	25
A:V	**100**	50	25
Participant #8			
B:A	25	**75**	0
B:V	50	**75**	25
A:V	0	0	25

5 - 100% is considered to represent a treatment effect.

EQUIPMENT:

- 12 equated passages from IRI protocols; 155-175 words each
- IBM compatible computer and monitor
- Xerox Personal Reader 7315 provided the auditory presentation
- Word Perfect 5.0 was used to enter and edit passages.
- BookWise program coordinated the visual and spoken text
- The print was black on a gray background and highlighted words were white on a black background.
- The computer voice of "Perfect Paul" was used because it had the clearest enunciation.

TREATMENT CONDITIONS:

Treatment consisted of 12 half-hour sessions during which the student was presented with a passage in one of three formats:

1. AUDITORY - student listened to passage on headphones

2. VISUAL - student read passage off the computer screen

3. BIMODAL - student both listened to and read the passage as presented by the computer

Both passage and format were randomly assigned throughout the study for each student.

RESEARCH ACTIVITY TIMELINE

PRETEST	TREATMENT	POST-TEST
	(SESSION 1 THROUGH SESSION 12)	
IQ measure SDRT 120 Word List IRI for fluency, accuracy & listening comp.	Each session consisted of : (a) 10 sight words (pretest) (b) 1st reading (c) 2nd reading (d) spontaneous recall (e) comprehension questions (f) 10 sight words (post-test) (g) session perception questions **Auditory, visual and bimodal conditions were paired randomly with the 12 equated passages for each subject such that each condition was presented four times.**	120 Word List IRI for fluency & accuracy

COMPARISONS BETWEEN BIMODAL AND TRADITIONAL READING USING SINGLE SUBJECT DATA ANALYSIS

The Bimodal condition consistently (75-100% of Nonoverlapping Data Points) benefited participants more than the traditional, visual condition for:

SPONTANEOUS RECALL:

*Bimodal > Visual for 6 out of 8 participants.

COMPREHENSION QUESTIONS:

*Bimodal > Visual for 5 out of 8 subjects

WORD RECOGNITION DIFFERENCES:

*Bimodal > Visual for 1 out of 8 subjects

STUDENT PERCEPTIONS:

- 8 out of 8 students preferred the bimodal format to the visual format; 7 out of 8 preferred bimodal over either unimodal formats.
- 6 out of 8 were eager to continue working with the computer as part of their reading program.

SUMMARY

The Bimodal presentation of text facilitated students' performance in several areas, especially when compared with the traditional visual presentation with which these poor readers were having little to no success.

Bimodal benefits for student performance:

- Spontaneous Recall of story information increased significantly under the bimodal condition as compared to the visual condition.
- Reading comprehension as measured by Comprehension Questions increased under the bimodal condition as compared to both the visual and auditory conditions.
- Student perceptions of the sessions showed a statistically significant preference for the bimodal condition and qualitative responses confirmed this finding.

No significant bimodal benefits were found for:

- Sight word recognition, which showed a significant increase using a pre-post test comparison, but further analysis indicated that the increases were not specifically related to the bimodal condition.
- Reading accuracy and fluency, probably because only four of the twelve sessions were bimodal, so little practice was available to affect these students.

CONCLUSIONS

- Bimodal reading has been shown to effectively increase reading comprehension for a sample of late-elementary school students who not only are struggling with reading, but also have emotional and behavioral problems which may further impede their education.

- Students differed in the degree that the bimodal presentation benefited them. The students who could read fewer sight-words at pretest seemed to benefit more from the bimodal condition than the others. Monitoring the appropriateness of passage difficulty for each student will help to maximize the benefits of the bimodal reading program.

- Future research should consider the benefits of greater exposure to bimodal reading.

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