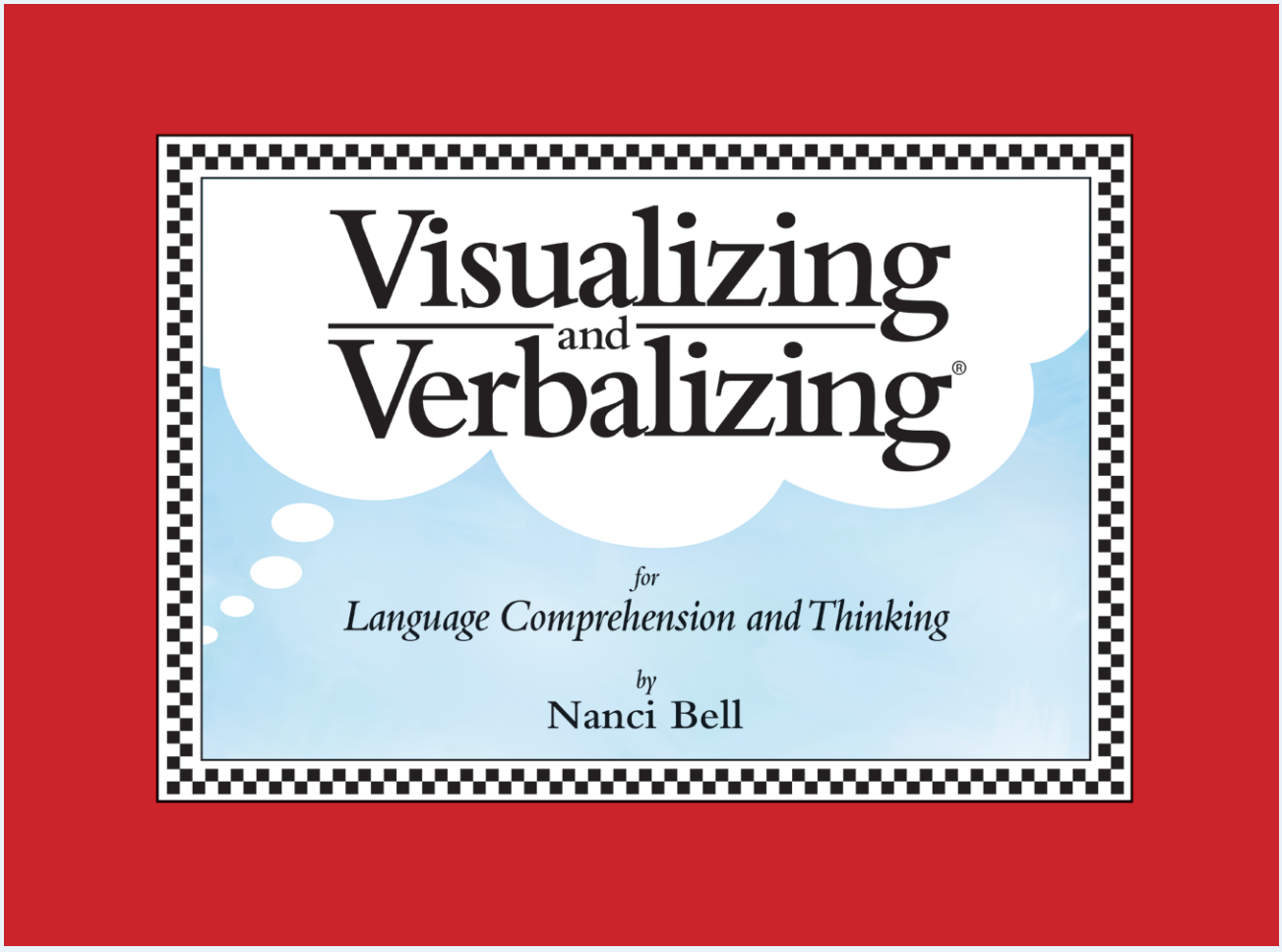
Current Efficacy Research for the Visualizing and Verbalizing® Program (V/V)



Program Summary

The Visualizing and Verbalizing® (V/V®) program develops concept imagery - the ability to create mental representations from language - as a basis for comprehension and higher order thinking. V/V is based on the tenets of Dual Coding Theory, which states that cognition requires an interplay between two systems—a verbal system specialized for language, and a nonverbal system specialized for processing nonverbal information in the form of modality-based mental images (Paivio, 2014; Sadoski & Krasny, 2019; Sadoski & Paivio, 2007). The development of concept imagery targets this imagery-language connection, leading to improvements in reading and listening comprehension, memory, oral vocabulary, critical thinking, and writing.

V/V sequentially stimulates concept imagery for oral and written language. Through a series of steps, students learn to create an imaged gestalt (whole), and to integrate imagery with language as a basis for all aspects of cognition, especially comprehension, vocabulary, and higher order thinking. The program's focus on concept imagery facilitates growth in the skills of 1) metacognition for comprehending oral and written language, 2) learning and retaining new vocabulary, 3) recalling key details in text to aid in comprehension, and 4) higher order thinking, such as getting the main idea, inferencing, predicting, evaluating, and drawing conclusions.

The skill of concept imagery is often assumed for fluent decoders. However, decoding fluency does not guarantee comprehension. Further, concept imagery is a critical foundation for good comprehension strategies. By explicitly developing a metacognitive strategy for vocabulary and comprehension, students can better access rigorous content standards. Instruction is explicit, systematic, and cumulative, and includes sample lessons on a specific scope and sequence for teachers to follow while differentiating instruction. Along with direct instruction, the instructional pedagogy employs a Socratic questioning strategy to develop student independence in their own learning process. The steps and strategies of V/V, though primarily used as an intervention for individuals weak in comprehension, can also integrate with any curriculum or language arts program.

Research Showing Program Effects

The implementation of the Visualizing and Verbalizing Program and its effects on students' comprehension abilities have been considered by numerous researchers. Several are highlighted in the following table and described briefly below.

Researchers	Year	*N*	Students	Method	Results	ESSA Tier*
Sadoski & Willson (State-level initiative)	2006	22 schools	Elementary and middle school students with demonstrated weakness in comprehension and/or reading	V/V used in schools alongside Seeing Stars and LiPS programs	Improvement in state testing. Schools implementing Lindamood-Bell instruction increasingly outperformed comparison schools in the Colorado Student Assessment Program during Lindamood-Bell implementation.	Promising
Murdaugh, Deshpande, & Kana	2015	45	26 children with ASD (13 experimental, 13 wait-list control) and 19 age- and IQ-matched typically developing children (students 8-13 years old	Intensive one-on-one V/V intervention– 4 hours/day, 5 days/week for 10 weeks	Improvement in comprehension measures as well as increased neural activation observed through fMRI imaging. Increased activation was observed in several brain regions, including the left cuneus, left middle occipital gyrus, bilateral postcentral gyrus, left inferior frontal gyrus, and other regions of the brain associated with visual processing and language comprehension.	Promising
Murdaugh, Maximo, & Kana	2015	53	31 children with ASD (16 experimental, 15 wait-list control; mean age 10.6) and 22 age- and Qmatched typically developing children (mean age 10.4)	Intensive one-on-one V/V intervention– 4 hours/day, 5 days/week for 10 weeks	Improvement in reading comprehension measures for ASD students in the experimental group, with similar results not seen for the control group with ASD. Experimental students also showed improved neural connectivity in Broca's area, Wernicke's area, motor regions, and left hemisphere language regions after intervention.	Promising
Maximo, Murdaugh, O'Kelley, & Kana	2017	28	28 children with ASD (14 experimental, 14 wait-list control; ages 9-13)	Intensive one-on-one V/V intervention– 4 hours/day, 5 days/week for 10 weeks	Improvement in reading comprehension ability shown through behavioral measures, as well as increased connectivity in the brain's "Reading Network".	Promising
Murdaugh, Maximo, Cordes, O'Kelley, & Kana	2017	25	25 children with ASD (14 experimental, 11 wait-list control; ages 8-13)	Intensive one-on-one V/V intervention– 4 hours/day, 5 days/week for 10 weeks	Improvement in reading comprehension measures accompanied by increased activation within the "Reading Network" of brain regions as well as increased bilateral connectivity.	Promising
Bednarz, Maximo, Murdaugh, O'Kelley, & Kana	2017	31	31 children (18 children with ASD and 13 typically developing children; ages 8-14)	V/V intervention– 4 hours/day, 5 days/week for 10 weeks	Established that low reading comprehension in ASD is typically accompanied by weak functional connectivity in brain regions dedicated to semantic processing.	Promising

*The ESSA Tiers of Evidence provide districts and schools with a framework for determining which programs, practices, strategies, and interventions work in which contexts and for which students. Attributes of studies designated Tier 3 ("Promising Evidence") include a "well-designed and implemented correlational study, [that] statistically controls for selection bias;" "Statistically significant positive effect on a relevant outcome;" and "No strong negative findings from experimental or quasi-experimental studies."

Abstracts

Sadoski, M. & Willson, V. (2006)

In 1997, Lindamood-Bell Learning Processes partnered with Pueblo School District 60 (PSD60), a heavily minority urban district with many Title I schools, to implement a theoretically based initiative designed to improve Colorado Student Assessment Program reading scores. In this study, the authors examined achievement in Grades 3–5 during the years 1998– 2003. PSD60 schools and schools statewide were compared through a series of repeated measures analyses of covariance controlling for school size, percentage of minority students enrolled, socioeconomic status, and the amount of time a school was included in the intervention. Statistically significant and increasing gains favoring the Lindamood-Bell reading intervention were found as compared to similar Title 1 schools across the state.

Key Words: Comprehension, Minority, Reading Development

Murdaugh, D. L., Deshpande, H. D. & Kana, R. K. (2015)

Murdaugh, Deshpande, and Kana (2015) investigated the effect of Visualizing and Verbalizing instruction in children with ASD, with the goal of assessing how the V/V approach to teaching language comprehension strengthens the participants. There were three groups in this study, including autism spectrum experimental group, an ASD waitlist group, and a typically developing group. Results indicated that children with ASD in the experimental condition made the strongest gains in reading comprehension compared to the other two groups. The results suggested that children with ASD benefitted strongly from the intensive structure of Visualizing and Verbalizing.

Key Words: Autism, Learning, Remediation, Comprehension.

Murdaugh, D., Maximo, J., & Kana, R. (2015)

Murdaugh, Maximo, and Kana (2015) investigated the effect of Visualizing and Verbalizing curriculum on connectivity of brain regions associated with reading comprehension in children with autism spectrum disorder. Participants underwent fMRI scans to assess changes in neural connectivity. Results showed that participants in the experimental group showed significant gains in reading comprehension whereas control group participants did not. These gains were associated with increased neural connectivity in brain regions associated with language processing.

Key Words: fMRI, Comprehension, Connectivity, Autism

Maximo, J., Murdaugh, D., O'Kelley, S., Kana, R. (2017)

Maximo, Murdaugh, O'Kelley, and Kana (2017) examined the neurobiological and behavioral impacts of Visualizing and Verbalizing in children with ASD. Participants were assigned to an experimental or control group. Results showed that children in the experimental group who received VV instruction had significantly improved reading comprehension scores compared to their control group counterparts. Additionally, the researchers found that this increase in reading comprehension ability was associated with changes in neural connectivity in brain regions associated with language comprehension.

Key Words: Autism, Comprehension

Murdaugh, D., Maximo, J., Cordes, C., O'Kelley, S., Kana, R. (2017)

Murdagh, Maximo, Cordes, O'Kelley, and Kana (2017) studied the effects of Visualizing and Verbalizing on reading comprehension capabilities in children with ASD. Participants were assigned to an experimental or control group, and all participants underwent an fMRI scan to assess changes in neural connectivity. Between scans, children in the experimental group received 200 hours of VV (4-hour sessions per day, 5 days a week for 10 weeks). Results showed that children in the experimental condition made significant improvements in reading comprehension compared to their control group peers. Additionally, these improvements were associated with greater activation of visual processing regions of the brain.

Key Words: Autism, Oral and Written Language, White Matter, Comprehension

Bednarz, H., Maximo, J., Murdaugh, D., O'Kelley, S., & Kana, R. (2017)

Bednarz, Maximo, Murdaugh, O'Kelley, and Kana (2017) studied the effects of Visualizing and Verbalizing on reading comprehension in children with ASD. This quasi-experimental study compared the performance of children with ASD to typically developing children. Results showed that all participants made significant gains in reading comprehension, regardless of ASD diagnosis. This study adds to the body of evidence suggesting that comprehension difficulties in children with ASD may be due to top-down semantic processing rather than decoding difficulties.

Key Words: Autism, Comprehension

Results on Measures of Reading Efficacy: Impacts of the Intervention

Here is what researchers in the field of reading have said about Visualizing and Verbalizing:

- "Our study revealed an improvement in reading comprehension as a result of the V/V intervention." (Maximo et al., 2017)
- "The findings of this study emphasize the importance of targeted interventions for children with ASD…" (Murdaugh, Maximo, & Kana, 2015)
- "The V/V intervention in our study has also contributed to an increase in functional connectivity in ASDEXP children. Increased connectivity between LMTG and left frontal (LIFG and LMFG) regions in the ASDEXP group was correlated with greater improvement in reading comprehension." (Murdaugh, Deshpande, & Kana, 2015)
- "[T]hose children who participated in the V/V intervention showed increased left hemisphere activation specific to the more complex tasks than the waitlist children. Interestingly, when comparing pre- to postintervention changes within the ASD-EXP group, results revealed increased recruitment of both visual processing regions (including occipital cortex, fusiform gyrus, and superior parietal lobule) and left hemisphere regions across experiments, suggestive of both task specific and global brain activation differences post intervention." (Murdaugh et al., 2017)
- "This pattern of gains suggests that V/V training strengthened the students' visualization skills such that they were better able to process and integrate certain types of visually mediated materials." (Johnson-Glenberg, 2000)
- "Results from student testing revealed that treatment clients showed significant gains in all areas, regardless of program exit status. School records for those who received program services showed that many had higher grades and were attending school on a more regular basis" (Burke et al., 2005).

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