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APHASIA READING CLUB OUTCOMES: ACQUISITION AND USE OF METACOGNITIVE READING STRATEGIES

Jessica Janota

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by

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A thesis submitted in partial fulfillment of the requirements
for graduation with Honors in the Speech Pathology and Audiology

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ALISON LEMKE
Thesis Mentor

Spring 2018

All requirements for graduation with Honors in the
Speech Pathology and Audiology have been completed.

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YU-HSIANG WU
Speech Pathology and Audiology Honors Advisor

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Jessica Janota
University of Iowa

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Alison Lemke
M.A., M.P.A, CCC-SLP, CBIS
Thesis Mentor
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Yu-Hsiang Wu
Communication Sciences and Disorders Honors Advisor

Abstract

Aphasia is a language disorder acquired due to a neurologic condition that disrupts the understanding and use of semantic, syntactic, morphological, and phonological knowledge of language. As a result, individuals with aphasia find it challenging to understand, speak, read, and write language. The Aphasia Reading Club (ARC) is an opportunity offered by the Wendell Johnson Speech and Hearing Clinic for people with mild to moderate aphasia to develop their reading skills within a group setting. Research shows that therapy, especially group therapy, develops reading abilities in people with aphasia due to combining positive psycho-social aspects of group therapy with clinical instruction. In ARC, clinicians provide a variety of reading supports to promote understanding of various levels of print sources dependent on each individual's reading ability. For this study, retrospective and prospective analysis using the MARSI was conducted to determine individuals' acquisition and use of metacognitive reading strategies over one year of ARC participation (Lemke, 2015). Results indicated that change in individuals' reading strategy use may reflect personal factors such as reading aid needs based on type/severity, ARC attendance, and frequency of reading outside of ARC. However, group averages so far show unified growth in all strategy types and overall metacognitive strategy use. By obtaining this information, the effectiveness of ARC and the most beneficial practices were highlighted, which can help develop best practices for aphasia reading groups.

Introduction

Aphasia is a language disorder that disrupts the understanding and use of semantic, syntactic, morphological, and phonological knowledge of language. As a result, individuals with aphasia find it challenging to understand, speak, read, and write language. The most common form of brain damage resulting in aphasia derives from a stroke. However, other types of brain damage that may cause aphasia include brain tumors, traumatic brain injuries, and neurological brain disorders that progress over time. Research shows that the cerebral hemispheres of the brain display evidence of left language dominance for most people. The area in the left cerebral hemisphere that interconnects the frontal lobe, temporal lobe, parietal lobe, Broca's area, and Wernicke's area is referred to as the center of language. However, there are exceptions to this claim since both hemispheres are needed for efficient use of language. Regardless of language hemisphere dominance, if damage occurs to any area of the brain it is possible for aphasia to arise (Albert & Helm-Estabrooks, 2004).

When lesions cause damage in the brain, several types of aphasia can manifest. Aphasia types include Broca's, Wernicke's, conduction, anomic, transcortical motor, transcortical sensory, global, and mixed. Each aphasia type is dependent on the site of lesion, some being more clear than others. For instance, the more transparent types are Broca's aphasia and Wernicke's aphasia that result when lesions occur at their location sites in the cerebral hemispheres. An example of a more obscure location is a lesion to the supramarginal gyrus and underlying white matter pathways connecting Wernicke's area to Broca's area, which results in conduction aphasia. Some lesion sites remain unknown such as in subcortical aphasia, which does not have locations clinically defined but has suspected areas such as the thalamus, head of the caudate nucleus, putamen, and/or internal capsule. Among the aphasia subtypes, each are categorized as either nonfluent or fluent. Nonfluent aphasias result in limited verbal speech, either single words or short phrases, and agrammatism, in which full grammatical structures are not present. Understanding of language is typically more well preserved in nonfluent aphasias. In contrast, fluent aphasias result in verbal output of longer phrases with ease of articulation, good prosody, and presence of grammatical constructions including real words and/or nonsense jargon. In Wernicke's fluent aphasia, comprehension of language is typically severely impaired. Although word-finding errors may disrupt speech flow in fluent aphasias, average phrase length remains within normal ranges. Nonfluent aphasias include Broca's, transcortical motor, global, and mixed. Fluent aphasias include Wernicke's, transcortical sensory, conduction, and anomic. (Albert & Helm-Estabrooks, 2004).

When discussing aphasia, theories, models, and classification systems are used to predict/describe language outcomes. A theory is a system of ideas or statements held as an explanation of a group of facts. For example, Brown's Microgentic Theory characterizes aphasic signs and symptoms as temporary disruptions that actually reflect a previously concealed earlier phase of normal language processing. Models differ from theories because they attempt to visualize or formalize a theory by putting it to work. The goal of a model is to simulate a specific phenomenon and provide an explanation to predict future behavior. Computational models state that various aspects of language can be represented as patterns of activity over interconnected neuron-like processing units. Patterns of these processing units differ by weighted connections that are manually fixed or develop through learning. Comparisons can be made between targets and given outputs to reduce errors. Lastly, classification systems label aphasia types into appropriate categories according to shared phenotypic characteristics. For instance, The Boston Diagnostic Aphasia Classification System has eight parameters that are rated from observed

performance on specific tasks. The parameters are articulatory agility, phrase length, grammatical form, melodic line, paraphasias in running speech, word finding relative to fluency, sentence repetition, and auditory comprehension. The magnitude of impairment across modalities determines classification. Overall, theories, models, and classification systems act as tools when discussing aphasia (McNeil & Copland, 2011).

Besides the location/type and theories/models/classification systems, aphasia can be analyzed according to the personal impact that it has on individuals' available use of language. A large impact of aphasia deals with the inability to read, which prevents individuals from living an interactive life. Within the brain, reading relies on coordinated activity of several cortical networks that process sounds, meanings, and visual representations of words in regards to semantics, syntax, morphology, phonology, and orthography. Unfortunately, damage to certain regions of the brain differentially disrupts specific processing components that give rise to predictable syndromes of reading difficulty in aphasia, called acquired alexias. Alexia is the inability to read efficiently due to impaired use of semantic relationships to understand words, processes required for syntax and morphology in sentences/text, the phonological system, and grapheme-phoneme mapping. Subtypes of alexia are phonological, deep, global, surface, and pure. Reading relies initially on the visual system, which coordinates with these processing components throughout the brain. When assessing alexia, reading aloud and reading comprehension are tested using words and sentences varying in semantic, syntactic, morphological, and phonemic complexity (Albert & Helm-Estabrooks, 2004).

The type of acquired alexia is dependent on the location of the damaged processing components of written language: perisylvian damage, extrasylvian damage, and peripheral damage. Perisylvian damage causes phonological alexia, deep alexia, and global alexia. Phonological alexia is the least severe form that is known for its lexicality effect, which means that real words are simpler to read than nonwords. Common mistakes involve visually similar words and morphologic errors. For example, errors might be "bride" instead of "bribe" as visually similar words and "driven" instead of "drive" as a morphologic error. Also, there is a grammatical class effect, which recognizes that nouns are more accurate than verbs in phonological alexia cases. In regards to reading, deviations are made from print and comprehension is impaired, as shown on standardized measurement results. Treatment plans focus on reestablishing word level letter-sound correspondences in sentences or paragraphs and oral reading activities. Deep alexia is known for its moderate severity, and predominant semantic errors. For example, a common semantic error might be "steak" instead of "grill". High-frequency words and highly imagable words are among the few words that are read correctly. During recovery, it is not uncommon for deep alexia to resolve to phonological alexia. When reading is impaired to the extent that there is less than 30% accuracy for single word reading stimuli, the diagnosis is global alexia. Treatment for global alexia focuses at the lexical level learning to retrain reading of specific words that have functional value (Beeson, Rising, & Rapcsak, 2011).

Extrasylvian damage is most known for causing surface alexia. Surface alexia impairs lexical semantic processing for reading but preserves phonological abilities. There is an overreliance on sublexical strategy where the basis of reading is letter-sound correspondences. A regularity effect exists that processes regularly spelled words more accurately than irregular words, which is the result of relying on phonological abilities. Also, low frequency words are particularly vulnerable to error. Treatment for surface alexia focuses on retraining irregular orthographic representations and interactive use of lexical semantic knowledge. Lastly, peripheral impairments cause pure

alexia. Pure alexia is when individuals have impaired reading but relatively preserved speech production and comprehension. There is a disruption of perceptual processing that is essential for rapid parallel identification of written words that results in letter-by-letter reading. Short words tend to be read more accurately using this letter-by-letter reading. Treatment focuses on improving speed and accuracy of word recognition at word level and text level. Although perisylvian, extrasylvian, and peripheral cortical damages cause several types of alexia, reading approaches and strategies can work to rehabilitate lost abilities (Beeson et al., 2011).

In regards to the rehabilitation process of reading in individuals with aphasia, there are a variety of treatment approaches available. Treatment approach options include: syntax based therapy, multiple oral reading therapies, direct attention training therapy, oral reading therapies, and computer-delivered therapy. For individuals with aphasia, the words and the syntax structure of sentences impact their difficulty level. Characteristics that increase difficulty are passive sentences, limited context knowledge, semantic reversible sentences, noncanonical sentences using object-subject-verb order compared to subject-verb-object, and multiple ideas in a sentence. Types of syntax based treatments used to help overcome syntactical comprehension difficulties are verb centered treatment, syntactically oriented treatment, and underlying forms of structure treatment. Verb centered treatment works on progressing from subject-verb-object to object-subject-verb sentences and matching commonly used verbs, agents, and themes. Syntactic oriented treatment improves production of particular sentence types by hearing and producing multiple sentences that share syntactic form. Lastly, underlying forms of structure treatment promotes generalization from complex sentences to those that are linguistically related but less complex (DeDe & Richtsmeier, 2011).

Multiple Oral Reading (MOR) focusses on rereading texts at home and in therapy sessions to facilitate whole-word recognition rather than letter-by-letter reading. The underlying hypothesis of MOR is that repeated reading makes word form recognition easy due to top-down influence from semantic and syntactic context. In fact, the immediate focus is improving reading rate and reading accuracy while reading comprehension is a byproduct of improved fluency. In order to see benefit from MOR, it is best for individuals to have good letter-by-letter reading and letter identification (Kim & Russo, 2010). Direct attention training focuses on nonlinguistic skills of language by targeting attentional abilities through repetitive drill activities. This therapy approach works to enhance sustained attention, selective attention, and auditory-verbal working memory to indirectly improve reading comprehension. Multiple times a week individuals are guided through activities that increase in difficulty. Before and after therapy sessions, reading probes with comprehension questions are administered. Treatment outcomes are analyzed by pre-/post- results of standardized assessments and a feedback questionnaire. Results typically show that improved attentional skills coincided with improved reading comprehension. Individuals' increased proficiency at sustaining attention and coping with distractions provides them with the ability to read more efficiently with less effort (Coelho, 2005).

Oral Reading Therapy for Language in Aphasia (ORLA) works to improve reading rate and comprehension in individuals with aphasia by providing treatment for phonological and semantic reading routes. ORLA treatments have individuals systematically and repeatedly read aloud sentences. Individuals listen twice to either a speech-language pathologist (SLP) or a computer read a sentence as they follow along with the written form of the sentence. Then, individuals attempt to read the sentence aloud with the SLP or computer before reading independently. There are four levels of connected discourse that vary based on difficulty in length and complexity of the reading materials. For evaluation, reading subtests are administered before and

after therapy to analyze rate of speech and correct information content. Based on pre-/post-results, it is typically found that reading rate and efficiency increase (Cherney, 2010). Computer-delivered therapy can administer independent reading therapy by measuring performance, controlling time spent on therapy, and providing therapy at a lower cost for patients. The goal of computer-delivered therapy is to administer efficient therapy without clinician assistance that generalizes to noncomputer language performance without stimulation. Computer-delivered therapy is best applicable to individuals with normal hearing and vision. Multiple times a week, computer-delivered reading comprehension therapy consists of ten visual matching activities and twenty-two reading comprehension activities. Computer stimulation such as shapes, colors, and animations that focus on reaction time, attention, and memory are used. Pre-/post- measurements for task sets are collected. Statistical review of the measurements typically indicate that computer-delivered therapy with little clinician support is efficient and generalizes in language performance due to the language content of the therapy and not simply computer stimulation (Katz & Wertz, 1997). Overall, a variety of treatment approaches can improve language disabilities in individuals with aphasia.

In addition to rehabilitative approach treatments, several strategies may be used with individuals with aphasia to help them develop their independent text comprehension abilities. These strategies come from the educational literature, however, not the aphasia literature. Common strategies include self-questioning, story-mapping, preview-question-read-self recite-test (PQRST), know-want to know-learned chart (KWL), and ask-consider-think check (ACT-Check). The self-questioning strategy is used to provide better literal and inferential reading comprehension of written text. While reading aloud, individuals stop periodically to answer pre-made questions related to the text. Typically, readers stop three times and answer a total of ten questions. Before strategy use, individuals undergo several training sessions to understand the routine. Afterwards, an ending comprehension test consisting of open-ended questions should be completed to determine the efficiency of self-questioning (Taylor, Alber, & Walker, 2002). The story mapping strategy also works to enhance literal and inferential reading comprehension by creating visual representations of written text on a graphic organizer. These maps identify characters, settings, problems, major events, and story outcomes. Similar to self-questioning, individuals receive training and can monitor the efficiency of their strategy use by attempting to answer an ending comprehension test (Taylor et al., 2002).

The Preview-Question-Read-Self Recite-Test (PQRST) is a five step educational reading strategy used to improve reading understanding and long term recall of information. This strategy benefits readers because it works to interconnect information to meaning/emotion. Previewing written text includes skimming the chapter, reading introductions and conclusions, paying attention to headings, and becoming familiar with figures. Questioning is asking “What am I supposed to learn in this section?” and “What are the main ideas based on the introduction, section headings, and conclusion?”. Next, the reading step is simply highlighting and notetaking while going through the entire text. Self-reciting consists of orally stating the main ideas learned from the text and then referring back to the chapter to see what was missed. Lastly, testing involves answering questions to check understanding the relevance of the text (Atkinson, Hilgard, & Smith, 2003). The Know-Want To Know-Learned (KWL) strategy improves reading comprehension among readers by using a graphic organizer to create a purpose to engage with the written text. A few benefits of this reading strategy are that it is specifically helpful for visual learners and can help clinicians know their readers’ interests. The graphical organizer is divided into three separate sections that are completed at different times during the reading process. First,

the K section increases motivation and attention by activating prior knowledge on the topic of the text before reading. Next, the W section compiles all the questions that readers are interested in answering. The L section should be completed after reading that states what was learned from the text (National Education Association, 2002). Lastly, the Ask-Consider-Think and Check (ACT-Check) is a four step strategy that addresses inference generation in reading. First, the reader creates a list of questions related to the text pertaining to themes, character conditions, and big goals. For example, "What does the story reveal?". Next, the reader considers the text when formulating possible answers to the questions. Then, the reader thinks about what they know and formulates good guesses. Lastly, the reader checks these guesses by consulting with others or referring back to the original text (Murza & Ehren, 2013). Overall, there are several strategies that may increase reading ability and independence for individuals with aphasia.

The desire to know more about strategy training for individuals with aphasia led to an ongoing clinical outcome study at the University of Iowa regarding measurement of metacognition strategy use in relation to participation in group therapy. Aphasia Reading Club (ARC) is an opportunity offered by the Wendell Johnson Speech and Hearing Clinic for people with mild to moderate aphasia to develop their reading skills within a group setting. According to research, it is known that therapy is effective in developing reading abilities in people with aphasia. For this reason, ARC's clinician/coordinator and assisting graduate student clinicians use a variety of reading supports to promote understanding of various levels of print sources dependent on each individual's reading ability. Research results also emphasize the importance of group therapy in general for people with aphasia. This is because individuals in group therapy typical feel more confident, supported, talkative, motivated, and socially accepted. ARC attempts to combine positive psycho-social aspects of aphasia groups with supports needed to improve individual participants' reading (Lemke, 2015).

For the study, an analysis of metacognitive strategy use as a result of participation in ARC was conducted. The purpose of this study was to use retrospective and prospective review of clinical information of ARC participants who have been involved in ARC for at least one year to determine individuals' acquisition and use of metacognitive reading strategies. By obtaining this information, the effectiveness of ARC and the most beneficial practices were highlighted, which can help develop best practices for aphasia reading groups (Lemke, 2015).

Research Questions:

- Do ARC patients report increased use of metacognitive reading strategies after at least one year of ARC participation, as measured by the Metacognitive Assessment of Reading Strategies (MARSI) questionnaire?
- Do the Metacognitive Assessment of Reading Strategies (MARSI) scores, when pre- and post- scores are compared, reveal any trends regarding types of strategies that are/aren't used by people with aphasia, and/or any trends regarding change in use of strategies over a period of at least a year?

Methods

Experimental Design

This study employed a pre-/post- design whereby four individuals with aphasia who participate in ARC were monitored in regard to acquisition and use of metacognitive reading strategies. Pre-/post- results were obtained and separated by approximately one year. These

results were used to determine the effectiveness of ARC strategy training and will continue to be used as part of ongoing outcomes research (Lemke, 2015).

Participants

1. A 59-year old male who was hospitalized for herpes encephalitis and later received a partial right-temporal craniotomy and lobectomy in November 2016. He experiences deficits in orientation, memory, and executive functioning with a diagnosis of mild anomic aphasia as well. In ARC, he has trouble getting the gist of comments and interpreting oral instructions. Typically, he relies on external memory aids and internal memory strategies. In ARC, his objectives are to work on using strategies such as highlighting, underlining, answering inference based questions, and elaborating on follow-up questions.

2. A 27-year old male who experienced a left temporal intraparenchymal hemorrhage and a subarachnoid intracerebral hemorrhage due to a middle cerebral artery aneurysm in July 2011. Afterwards, he was diagnosed with moderate/severe Broca's aphasia and right-sidedness hemiparesis, which has created difficulty with auditory comprehension, verbal expression, reading, and writing. He primarily communicates verbally and frequently uses 3-4 word utterances or short phrases marked by filler words. In ARC, he is working on answering basic comprehension questions, oral reading skills, and interacting with the group. The overall goal is to increase his independence in everyday living situations by improving functional communication.

3. A 41-year old male who suffered a stroke in 2013, which resulted in mild anomic aphasia and right-side hemiparesis. Due to poor mobility, a motorized chair is utilized. His language use is fluent and grammatical but is additionally characterized by reduced rate and mild articulation errors consistent with apraxia of speech. In group settings, difficulties with auditory comprehension in background noise and text-based inferences are experienced. Temporal goals are to read aloud short paragraphs fluently, answer inferential questions, and independently interact with others with minimal difficulty. Overall, this participant uses ARC to improve reading comprehension, oral reading skills, and strategy application.

4. A 37-year old male who experienced a left ischemic stroke resulting from an arterial dissection in February 2014. A moderate Broca's aphasia diagnosis following his stroke resulted in moderate defects in both expressive and receptive language skills as well as right inferior quadrantonopia. Oral communication typically consists of 3-5 word utterances and comprehension is accurate for simple sentences. Assistance is provided using pictures, videos, a smart phone, and calendar for more complex sentences. Goals in ARC are to improve reading comprehension, auditory comprehension, sentence formation ability, and word-retrieval skills.

Procedures

Screening. Before participating in ARC, participants complete a brief protocol to assess their reading ability and reading interests. The protocol consists of parts of typical aphasia evaluation tests, including the Reading Comprehension Battery for Aphasia (RCBA), writing subtests of the Boston Diagnostic Aphasia Examination (BDAE), and the Metacognitive Awareness of Reading Strategies Inventory (MARSI). The results of all of the ARC protocol evaluations and assessments are documented and filed in participants' medical record at the Wendell Johnson Speech and Hearing Clinic. For this study, consent from participants for MARSI and medical chart reviews was obtained. The information from medical charts was used for determining nature/severity of aphasia, goals, and individual progress. The participants' names, demographic

information, and clinical documents are Protected Medical Information (PMI) under HIPPA regulations (Lemke, 2015).

Participation. As stated prior, ARC is an opportunity for individuals with aphasia to work on reading in a group environment. In a semester, there are 12 ARC meetings that are typically 1.5 hours in length. The first 45 minutes is used to divide ARC members into small groups that provide more focused therapeutic activities according to severity level. Afterwards, all ARC members meet for a large group activity during the second 45 minutes. In large group, readings and discussions are guided by clinicians who work on comprehension and inference making using metacognitive reading strategies. These may include highlighting, underlining, summarizing key points, and adjusting reading rate, that always involve use of either KWL, PQRST, or story-mapping strategies. Each week a home reading assignment is given to prepare participants for the following week's meeting (Lemke, 2015).

Data Collection. In order to determine pre-/post- individual strategy use, the Metacognitive Awareness of Reading Strategies Inventory (MARSI) was used. This survey is simply a list of 30 different reading strategies with each strategy categorized as either a global (13), problem-solving (8), or support (9) reading strategy. For example, "I read slowly but carefully to be sure that I understand what I am reading" and "I use reference materials such as dictionaries to help me understand what I read". For each reading strategy, readers score themselves on a 1-5 scale (1-I never or almost never do this, 2-I do this only occasionally, 3-I sometimes do this, 4-I usually do this, 5-I always or almost always do this). When scoring, a raw-score and average score for each reading strategy category is calculated, which shows the type of strategy a reader is using most. Also, a raw-score and average for overall reading strategies is calculated, which indicates how often a reader is using strategies when reading. The average key considers a score of 3.5 or higher a high use of reading strategies, 2.5-3.4 considered medium use, and 2.4 or lower indicating that not many reading strategies are being used. If participants are expected to have difficulty while completing the MARSI, readers are used to read MARSI items aloud. In this study, Participant 2 and Participant 4 used a reader while Participant 1 and Participant 3 completed the MARSI independently. In regards to pre-/post- administrations, the pre- MARSI occurred as early as possible during the participant's first semester of ARC while the post-MARSI was completed approximately a year later. Assuming that participants do not come to the group with a lot of knowledge about reading strategies, this procedure provides measures on the first year that they are being exposed and interactive with different strategies. In general, the MARSI measures and aims to create self-awareness of readers' use of reading strategies (Mokhtari & Reichard, 2002).

Data Analysis

In order to analyze data that was collected from the pre-/post- MARSI administrations, nonparametric statistics were completed. The test used in this study was the Wilcoxon T-Test. Wilcoxon is a two-tailed t-test for data that does not fit normal distribution. Due to limited participants in this study, normal distribution was not met. The Wilcoxon compares two repeated measurements, such as MARSI administrations, on a single sample to assess whether mean ranks differ. By using this test, raw-score means for each strategy type and overall strategy use were analyzed. Data medians for each category were collected as well (Lemke, 2015).

Results

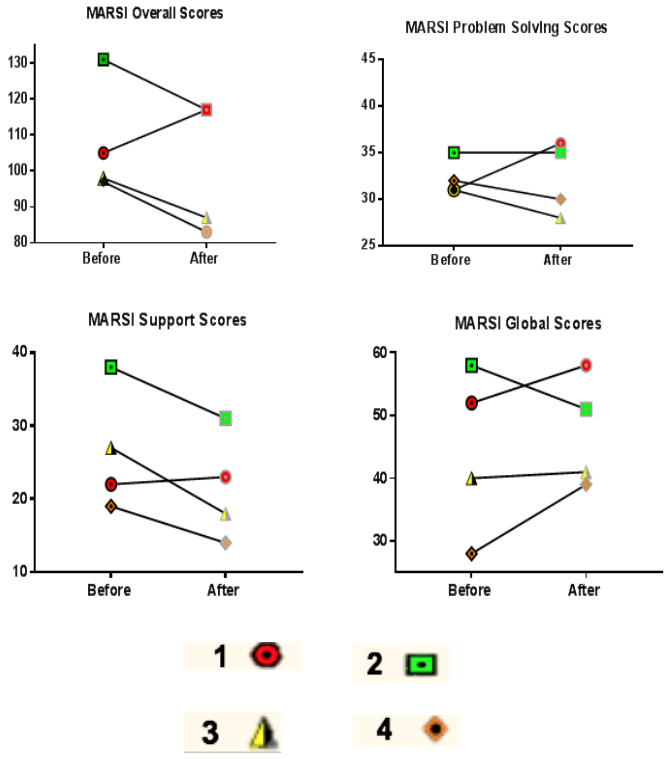
Participant 1	Before (Raw, Mean)	After (Raw, Mean)
Global	52, 4.0	58, 4.5
Problem-Solving	31, 3.8	36, 4.5
Support	22, 2.4	23, 2.6
Overall	105, 3.5	117, 3.7

Participant 2	Before (Raw, Mean)	After (Raw, Mean)
Global	58, 4.4	51, 3.9
Problem-Solving	35, 4.3	35, 4.3
Support	38, 4.2	31, 3.4
Overall	131, 4.3	117, 3.9

Participant 3	Before (Raw, Mean)	After (Raw, Mean)
Global	40, 3.1	41, 3.2
Problem-Solving	31, 3.9	28, 3.5
Support	27, 3.0	18, 2.0
Overall	98, 3.3	87, 2.9

Participant 4	Before (Raw, Mean)	After (Raw, Mean)
Global	28, 2.2	39, 3.0
Problem-Solving	32, 4.0	30, 3.8
Support	19, 2.1	14, 1.6
Overall	97, 3.2	83, 2.8

Combined Descriptive Statistics	Raw Mean Before	Raw Mean After	Median Before	Median After	P-Value	Significant
Global	44.5	47.3	46.0	46.0	.6250	NO
Problem-Solving	32.3	32.3	31.5	32.5	.9999	NO
Support	26.5	21.5	24.5	20.5	.2500	NO
Overall	107.8	101	101.5	102	.3750	NO



Participant charts (above) depict individual raw and mean scores for each category, which provides insight on the acquisition and use of metacognitive reading strategies measured over one year. The graph (left) displays individual numerical data in a visual manner. As shown by the data, variability of change was seen amongst the four newer ARC participants. Change in metacognitive reading strategy use can consist of an increase in use of all strategy types, a mixture of increases and decreases across categories, or a decrease in all strategy areas. With exposure to clinical instruction provided by ARC, increased use of metacognitive reading strategies was projected. However, this was not the case for all participants.

Participant 1: Increased use in all categories.
Participant 2: Decreased use in all categories other than problem-solving strategies that had no change recorded.
Participant 3: Decreased use in all categories besides a slight increase in global reading strategies.
Participant 4: Decreased use in support, problem-solving, and overall strategies while global strategy use increased.

After combining the scores of the four newer ARC participants, similar patterns to those in the individual charts appeared. Amongst these four participants, raw-score means signal increased or stable acquisition and use of global and problem-solving reading strategies while support reading strategies and overall use trended downward. In regards to median change, support strategies declined, global strategies remained the same, and problem-solving along with overall strategy use increased. P-values from the Wilcoxon did not show enough significant difference for change to be statistically significant in any metacognitive reading strategy category. However, when the data from these four newer ARC members is added to a larger ARC data base (10 people), raw-score means so far show unified growth in all strategy types and overall metacognitive strategy use (chart below).

10 Participants Raw MARSI Means	Before	After
Global	42.2	44.3
Problem-Solving	28.2	29.9
Support	23.2	24.0
Overall	95.4	98.2

Discussion

As revealed by the MARSI data collected, there is variability regarding change in global, problem-solving, and support metacognitive reading strategies, which contributes to overall reading strategy use. It is important to note that decreased use of a type of metacognitive reading strategy is not necessarily a negative. In fact, individuals may display a decrease in a certain type of strategy due to discovering that other types of reading strategies work best for their needs. Other factors that may impact results include ARC attendance and frequency of reading outside of ARC therapy. Consistent exposure to reading materials is critical to the generalization of reading skills beyond ARC sessions. Below are explanations that describe facilitating and/or impeding factors on individual numerical data over one year of ARC.

Participant 1: Increased use in all types of metacognitive strategies alongside heightened overall use is the result of his mild condition, fairly consistent attendance, and efforts to complete reading material assigned by ARC clinicians outside of therapy sessions.

Participant 2: Harmonious decline in use of all metacognitive reading strategy types, leading to regression of overall use, is likely the result of wavering ARC attendance as well as few attempts to read outside of ARC therapy sessions.

Participant 3: Due to a very mild diagnosis of aphasia, this individual's decline in overall metacognitive strategy use stems from less reliance on reading strategies. Instead of ARC increasing the use of all strategy types, it has helped him discover that global reading strategies are what suit his needs best, which results in a decline in other types and overall use.

Participant 4: With a more severe diagnosis, exposure to metacognitive reading strategies leads to immediate use out of necessity in order for reading material to be better comprehended. As shown in the data, this individual gravitated towards global metacognitive reading strategies that were taught through clinical instruction. It is likely that the strategies most emphasized in ARC are the types that Participant 4 retains best.

The combined data suggests that ARC naturally targets the development of global metacognitive reading strategies. This is apparent due to repetitive practice with KWL, PQRST, and story maps that require the use of global practices. For instance, story maps allow participants to readily visualize reading material that would otherwise be dominantly text-based, which emphasizes the global reading strategy "I use tables, figures, and pictures to increase my understanding". With consistent group activities such as those in ARC, clinicians guide participants of ARC towards pursuing global metacognitive reading strategies.

This study provides potentially useful information about best practices for conducting aphasia reading groups. It strives to indicate whether or not and how people with aphasia perceive that their reading skills/use of reading strategies improve as a result of group reading therapy as well as determine whether or not objective evaluations show actual reading improvement (Lemke, 2015). Limitations exist for the generalization of results to other groups due to the small number of participants and its local nature. However, it is believed that as the larger ARC data base grows in numbers, significant statistical difference between pre-/post- MARSI administrations will be validated. Since the numbers of participants analyzed in this study is small, a potentially beneficial recommendation is that ARC-styled reading groups be implemented with outcomes studies in other places, so that more can become known about benefits of reading groups for people with aphasia (Lemke, 2015). Future analysis should focus on change in strategy use as a function of type/severity of aphasia, ARC sessions attended, and frequency of reading outside of ARC.

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