Yogic Breathing and Ayurveda in Aphasia: A Case Study

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Purpose: We present a case study of a woman who used yogic breathing as Ayurvedic medicine in her recovery from poststroke aphasia. Ayurvedic medicine is one of the most ancient medicines of the world, but it is not widely used for aphasia rehabilitation in many Western countries. The description of this case aims to further the understanding of the benefits that this type of medicine may provide to poststroke patients living with aphasia. **Method:** After her stroke, the patient received brief conventional language therapy for her aphasia. At 5 weeks post stroke, she received no further conventional rehabilitation; instead, she consulted with a Vedic priest. She followed a regimen of different body manipulations, yogic breathing techniques, and ingestion of coconut oil. Cognitive and language testing was performed throughout a 3-month period while she was involved in this therapy. **Results:** Overall, improvement was noted in language, visual attention, and some mood measures. **Conclusion:** Although case studies lead to limited conclusions, changes were observed for this individual using Ayurvedic medicine. Given the changes in language and some aspects of cognition seen in this patient, further exploration of the effectiveness of yogic breathing and Ayurvedic medicine in the treatment of poststroke aphasia is warranted. **Key words:** *aphasia, attention, Ayurveda, language, mood, yoga*

Ayurveda is one of the most ancient systems of medicines of the world, originating in India at approximately 5000 BC.[1] In Sanskrit, an ancient precursor of modern Hindi language, "ayus" means "life" and "veda" means "knowledge."[2] Ayurvedic medicine treats diseases holistically by focusing on the mind, body, and spirit through medicinal herbs, diet, spirituality, lifestyle, and yoga.[1] Preventive care is emphasized as much as disease management. Presently, Ayurveda remains one of the predominant traditional systems of medicine in India.[1,3]

Ayurvedic medicine differs from conventional Western medicine in that it includes a qualitative process-based understanding of human functioning that acknowledges the internal well-being of the person and his or her psychospiritual component, whereas Western medicine concentrates on the neurochemical and quantitative aspects of human functioning.[4] Because of these differences, Ayurvedic medicine is considered a complementary and alternative medicine (CAM) in the United States.[5] CAMs are not in conformity with the methods and beliefs of the dominant group of a society's medical practitioners.[6] The popularity of many CAMs as a supplement to conventional medicinal practices has increased in the United States.[7,8] From 1990 to 1997, use of CAM among Americans increased from 33.8% to 42.1%.[7] A government survey conducted in 2007 demonstrated similar numbers, with 38% of adults and 12% of children using some form of CAM.[9] This increase may be a result of widespread changes in "values, beliefs, and philosophical orientations toward health and life" in the United States.[10(p1548)]

A report of the use of Ayurvedic medicine in the United States indicates that more than 200,000 adults have used this form of treatment.[11] The effectiveness of this approach in treating a variety of diseases is understudied because of the inherent difficulty in investigating a practice that is individualized and involves integration of factors such as yoga, breath work, diet, herbs, and

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meditation.[5,12] Despite this complication, evidence of the effectiveness of Ayurvedic medicine and its application to clinical populations and the aging brain does exist.[13] Although few reports of its use with poststroke patients have been published, it is customary in India to use Ayurvedic medicine to treat impairments associated with stroke, such as aphasia. Some aspects of Ayurvedic medicine have been investigated in patients with stroke; however, study of the integration of all aspects of Ayurveda with patients has not been reported.

CAM approaches may reduce the linguistic impairments associated with aphasia, although the mechanism by which they improve language has not been determined. Individually, relaxation training, mindfulness meditation, and imagery show promise in the treatment of aphasia, but there are too few studies to provide conclusive evidence that CAM approaches are beneficial.[14] Given the individualized nature of Ayurvedic medicine, case studies or single-subject research designs may yield the most information about the potential value of Ayurvedic medicine in treating poststroke impairments.[15] In an effort to contribute to our understanding of CAM approaches that may aid in the treatment of poststroke impairments, such as aphasia, we present a case study of a woman living with aphasia who used Ayurvedic medicine to treat her linguistic and cognitive impairments.

Case Report

Participant

S.I., a 63-year-old right-handed homemaker from India with 10 years of formal education, was seen after she had a left-hemisphere stroke. S.I. has been living in the United States for more than 25 years. Before her stroke, she spoke both Hindi and English. Her family reports that she demonstrated better comprehension than production of the English language before her stroke. Brain imaging results demonstrated acute left frontotemporal lobe infarction. She exhibited right hemiparesis of upper and lower extremities and aphasia. She was transferred to a comprehensive rehabilitation setting 3 weeks post stroke where she received physical, occupational, and speech-language therapy for 2 weeks. On admission, S.I. was described as oriented to person, place, time, and situation with appropriate mood and affect. She also presented with right hemiparesis, mild dysarthria, expressive aphasia, cognitive-linguistic deficits, and dysphagia before her final rehabilitation. At discharge, S.I. was described as having done "well," although she was still diagnosed with expressive aphasia. She returned home with her family and received no further speech-language therapy.

Ayurvedic treatment

After her discharge from rehabilitative care, the family contacted a Vedic priest who initiated her Ayurvedic treatment, which included different body manipulations, training in breathing techniques, and a suggestion to ingest coconut oil. After she experienced initial physical improvement, he recommended a balanced type of breathing called *anulom vilom,* or alternate nostril breathing. *Anulom vilom* (*anulom,* the right order; *vilom*, going against) is a type of pranayama that is believed to affect the sympathetic nervous system, grip strength, and anxiety[16-18] and is defined as a regulation of the breath.[19,20] Anulom vilom is practiced by occluding the right nostril, inhaling through the left nostril, holding the breath for a few seconds, then occluding the left nostril and exhaling from the right nostril. This pattern is then reversed. S.I. completed 17 weeks of anulom vilom (alternate nostril breathing), practicing 20 minutes a day over 17 consecutive weeks for a total of 105 days (as recorded on a practice sheet). Patanjali's yoga sutras included Ashtanga yoga. *Asht* in Sanskrit means 8 and *anga* means limbs; 1 of the 8 limbs of Ashtanga in spiritual yoga is breathing practice, also called *pranayama.*[19,20] It is thought that certain types of yogic breathing practices can influence autonomic nervous system functions to bring "balance" to the body after mental or physical illness.[21] In addition, she was ingesting 1 tablespoon of coconut oil daily. Although she had received speech-language therapy while in the rehabilitation hospital, she was no longer receiving any speech or language therapy. During the 14th week of the study, she had a cardiovascular episode (suspected myocardial infarction) and was admitted to the intensive care unit for observation for a few days; a pacemaker was placed before discharge.

Assessment

Three cognitive and language assessments were conducted over time as S.I. engaged in the treatments suggested by the Vedic priest. An initial assessment (before beginning anulom vilom) was administered, followed by a midstudy assessment (after 8 weeks of practice) and a final assessment at the end of 17 weeks. For the purpose of this article, data from pretests and posttests are presented in their entirety. Assessments were translated into her native language (Hindi) as needed.

S.I.'s performance was assessed with a language task (Western Aphasia Battery-Revised [WAB-R][22]), attention tasks (Continuous Performance Test II [CPT-II][23] and the Color Trails Test [CTT][24,25]), and measures of mood (the Beck Anxiety Inventory [BAI],[26] the Beck Depression Inventory-II [BDI-II],[27] and the short form of the Geriatric Depression Scale [GDS][28,29]).

Prestudy assessment

Initial assessment results from the WAB-R showed a mild anomic aphasia type (aphasia quotient [AQ] = 84.9/100). Although the information content of S.I.'s spontaneous speech was good (9/10), she demonstrated paraphasias and marked word-finding difficulties without any sign of dysarthria (fluency of spontaneous speech = 6/10). The scores revealed a naming deficit (8.2/10) with greater impairment in tasks that involved naming from memory (eg, a task that required her to name as many animals as possible in 1 minute). She demonstrated a reduced ability for repetition (9.3/10) and impaired reading (7/10) and writing ability (6/10) at the sentence level, showing the characteristics of word-by-word reading. On auditory verbal comprehension tasks such as yes/no questions, word recognition, and sequential commands, her score was 9.5/10. Drawing, block design, calculation, and Raven's Coloured Progressive Matrices are a part of the constructional, visuospatial, and calculation (nonlinguistic) skills on the WAB-R, and she scored 8.4 out of 10 on the subtest. No sign of apraxia was evident. Language quotient (LQ) and cortical quotient (CQ) scores on the WAB-R derived from the different subtests were 78.4 and 83.47, respectively.

The performance on cognitive functions (CPT-II and CTT) was relatively normal. On the CPT-II, the Confidence Index for neurological deficit was 38.77%, which means that her performance is less like those with neurological deficits. The CPT-II discriminant function indicates that the results better match a nonclinical profile than a neurologically impaired clinical profile. Of the different measures of the CPT-II, the percentage of omissions (0.62%) fell within the average range, suggesting that she responded appropriately to the target responses. Hit reaction time is the mean response time for all target responses and was measured to be within the average range (409.92 ms). Measures of omissions and hit reaction time are suggestive of inattention. Percentage of commission measures inattention and impulsivity and was observed in the average range (41.67%). Any response that occurs less than 100 ms after a stimulus is referred to as a "perseveration," and S.I.'s percentage of perseverations (0.62%) was markedly atypical in comparison with a normative group, which is indicative of her impulsive behavior. Vigilance scores (hit SE block change = 0) suggested response consistency throughout the task.

Both sections of the CTT were administered. The standard scores obtained from the individual time scores on the CTT 1 (120 seconds) indicate a severe degree of impairment. On CTT 2 (180 seconds), a clinical interpretation of mild to moderate impairment was reported. Her impairment is more general and cannot be specifically attributed to cognitive interferences caused by simultaneous alternating and sequencing. Her performance on the tasks may have been affected by her use of her nondominant left hand (as a result of right hemiparesis from the stroke).

In addition, her performance on the following mood assessments suggested minimal or no anxiety and depression: BAI (score = 0, minimal level of anxiety), BDI-II (score = 8, minimal depression), and the GDS (score = 3, no depression).

Poststudy assessment

At the end of the 17-week period, a final assessment was conducted. As revealed by the various tests, S.I. showed improvement in some

linguistic skills. A poststudy assessment with the WAB-R revealed an AQ of 92.6 with mild severity (LQ = 89.9, CQ = 92.1). Although her speech was comparatively preserved in terms of syntax and phonology, word-finding difficulty was still evident (information content 10/10, fluency 8/10) during spontaneous speech. Certain semantic substitutions and circumlocutions were also evident in her speech. She showed an increase in the naming scores (9.5/10). Auditory comprehension scores (9/10) and repetition scores (9.8/10) remained constant over the period of study. Her responses on the writing output task (8.4/10) paralleled her spontaneous speech output on the picture description task, with seemingly longer sentences of increasing complexity and fewer graphemic errors. She also demonstrated improvement in her reading skills (9.1/10) for comprehension of sentences as compared with her previous score. Therefore, the LQ increased to 89.9 in comparison with the prestudy assessment score. She performed better on the construction, visuospatial, and calculation tasks; her overall score was 9.3 out of 10. As a result, her CQ on the WAB-R also increased to 92.1.

On the CPT-II, the Confidence Index for neurological deficit increased to 50.15%, which at final testing favored a clinical classification, meaning that her performance was more closely aligned with individuals with known neurological impairments. Although the range between 40% and 60% is described as more difficult to interpret and considered "inconclusive,"[23] the percentage of omissions (0.62%) and commissions (30.56%) continued to be within the average range. The mean reaction time of the responses was 406.16 ms with a little inconsistency in the response speeds, indicating inattentive behavior. The substantial increase in percentage of perseverations (3.41%) was indicative of impulsive behavior. Of the different vigilance measures, hit SE block change (-0.12) scores were within the acceptable performance range.

When compared with the prestudy assessment scores, the CTT scores had improved during the course of the study. Standard scores from the individual time scores on the CTT 1 (60 seconds) and CTT 2 (121 seconds) were indicative of average response. Mood assessment showed similar trends on the BAI (0, minimal levels of anxiety), BDI-II (5, minimal depression), and GDS (3, no depression).

Summary of the findings

Overall, S.I.'s performance on language measures improved over the course of the case study. On the WAB-R, she demonstrated a gradual increase on the AQ, LQ, and CQ as well as improved performance on specific subtests (**Figure 1**). The scores are suggestive of possible improvement in various areas of language (eg, fluency, auditory comprehension, repetition, naming, reading, and writing) and nonlanguage (constructional) skills. Her performance on the CPT-II demonstrated fewer deviant values on the prestudy assessment in comparison with the poststudy assessment; this decrease in performance may have been a result of the other health issues (myocardial infarction at 14 weeks) she experienced during the course of the study (**Figure 2**). On the CTT, the reaction times on the 2 sections indicate that she experienced improvement in sustained visual attention involved in perceptual tracking and simple and alternate sequencing (**Figure 3**). Her mood was assessed on different tests (BAI, BDI-II, and GDS), and she was found to have minimal levels of anxiety without any traces of depression (**Figure 4**) with a gradual decrease in scores for the BDI-II.

Discussion

S.I. was advised to perform alternate nostril breathing as a result of her consultation with the Vedic priest, and her progress was followed over the course of 17 weeks. Although she was instructed to practice 30 minutes a day, she consistently practiced alternate nostril breathing approximately 20 minutes a day. Overall, her language and cognitive skills improved. Increases in AQ, LQ, and CQ on the WAB-R were observed by the end of 17 weeks. Additionally, increases in spontaneous speech, fluency, and naming were observed. Improved performance on an attention task was also observed for S.I. during the course of the study. Her time to complete the CTT 1

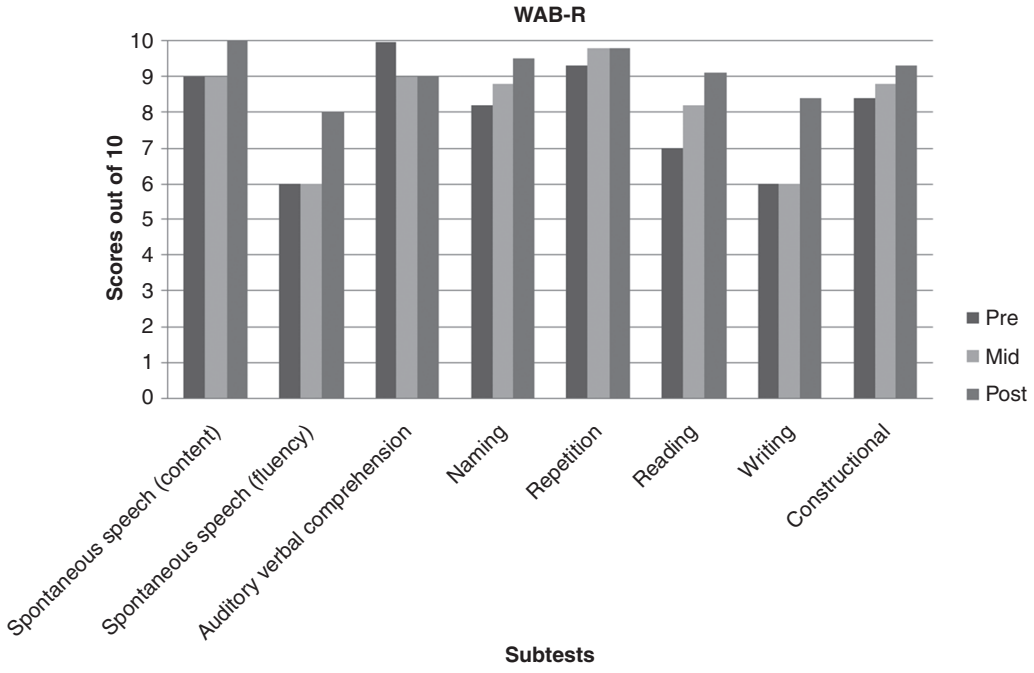

Figure 1. Western Aphasia Battery-Revised (WAB-R) subtest scores for pre-, mid-, and poststudy assessments.

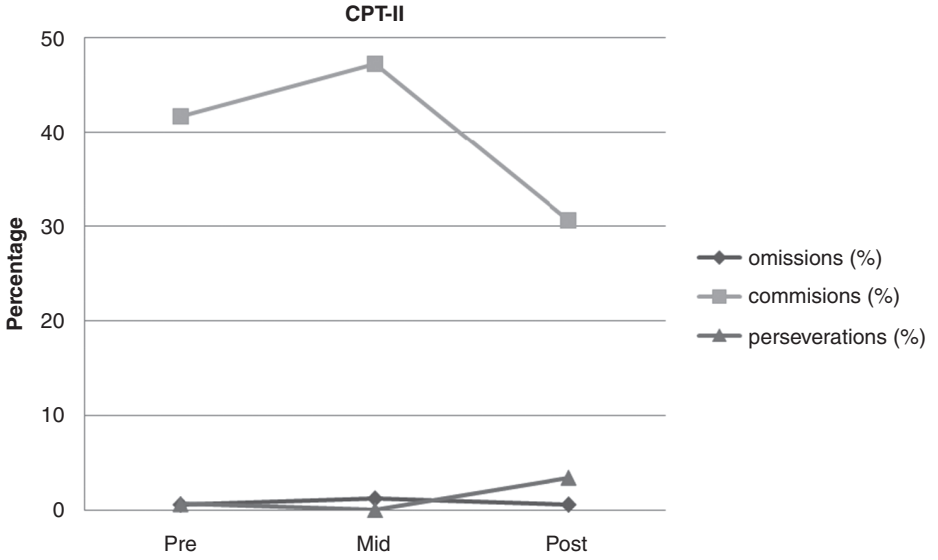

Figure 2. Continuous Performance Test II (CPT-II) percent omissions, commissions, and perseverations for pre-, mid-, and poststudy assessments.

and CTT 2 decreased, demonstrating improved performance. These changes in performance suggest that use of yogic breathing as Ayurvedic medicine may have been beneficial for this particular individual with aphasia.

Limitations to this study include the potential impact of spontaneous recovery on S.I.'s performance. Additionally, it could be argued that aspects of the treatment are similar to other treatment options such as meditation. We cannot

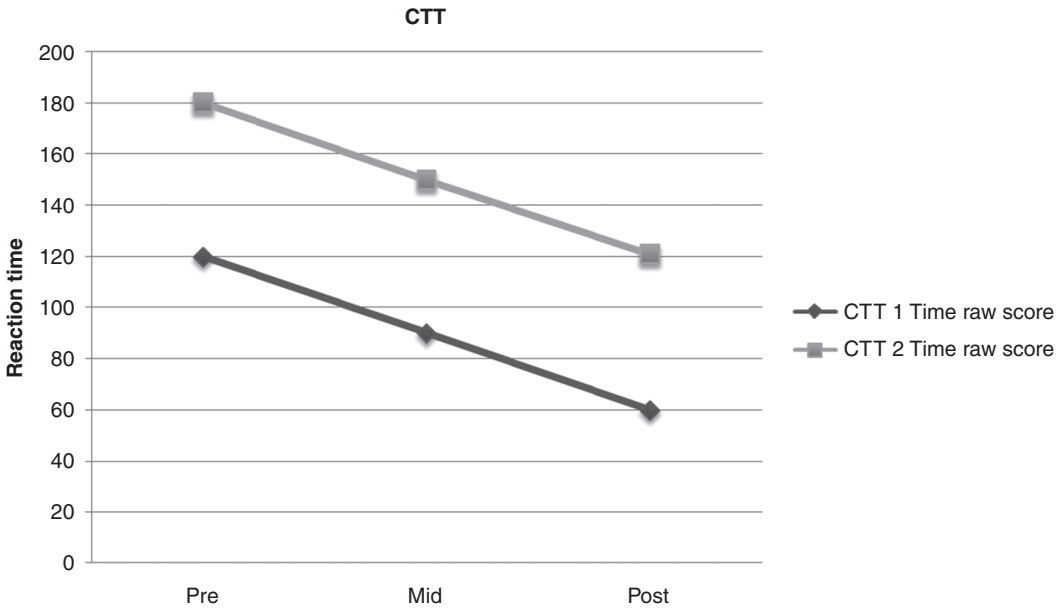

Figure 3. Color Trails Test (CTT) 1 and 2 reaction times for pre-, mid-, and poststudy assessments.

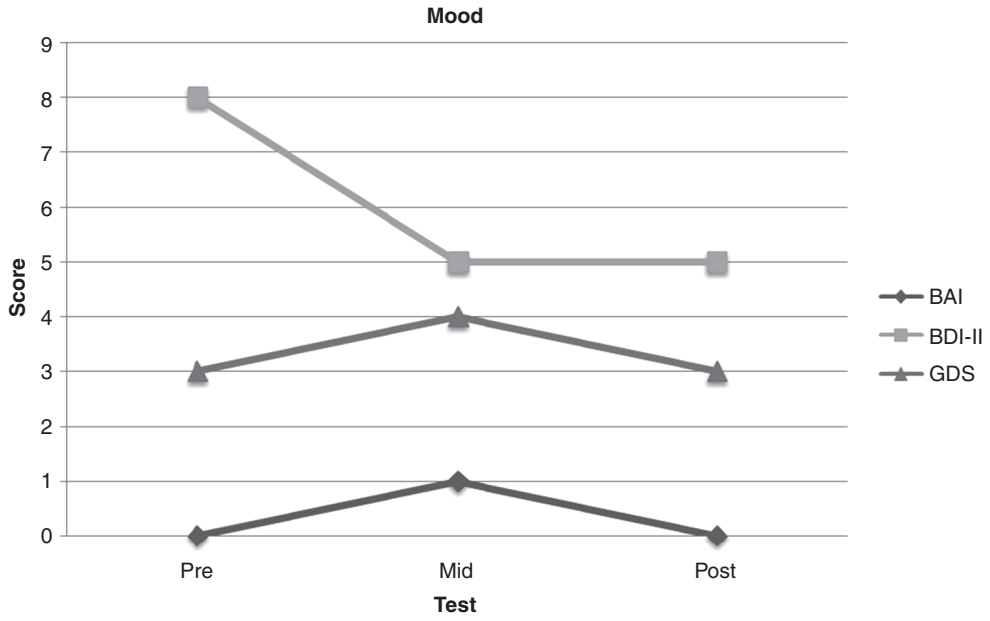

Figure 4. Beck Anxiety Inventory (BAI), Beck Depression Inventory-II (BDI-II), and Geriatric Depression Scale (GDS) scores for pre-, mid-, and poststudy assessments.

identify the mechanism for change based on this case study, because the meditative component of the pranayama practices may have produced similar results based on previous positive findings of increased attention and decreased anxiety after meditation.[30,31] Recent findings of language changes after unilateral nostril breathing for individuals with aphasia suggest that breathing practices may affect language post stroke.[32] This is an empirical question, and additional research

is needed to determine the specific causes of the changes observed.

Furthermore, it is possible that S.I.'s improved performance on certain measures was simply a result of the practice of these particular tasks. Using the same tasks over the course of 3 assessments could translate to improved performance. However, this is unlikely because of the prolonged time between tests (8-9 weeks). Additionally, because this individual was only 3 months post stroke, and therefore had not yet reached her recovery plateau, continued spontaneous recovery could contribute to the positive findings. The potential myocardial infarction and pacemaker placement at 14 weeks could also have affected her cognitive and language performance. A future study with a single-subject design would help to eliminate these limitations by allowing for more control and could help to determine whether yogic breathing as Ayurvedic medicine would be beneficial for other individuals with aphasia. Self-rating and/or perception of language and cognitive skills would also be valuable to include in future studies. Overall, the findings suggest that cautious optimism and further study are warranted. Few studies have investigated the use of yogic breathing and Ayurveda to treat poststroke aphasia, and it may be a promising adjunct for conventional rehabilitation. Given the changes in language function and some aspects of cognition seen in this individual, further exploration of the effectiveness of yogic breathing and Ayurvedic medicine in the treatment of poststroke aphasia is reasonable.

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