



Studies on the Potential Benefits of the Forbrain® Headset

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INTRODUCTION

The Forbrain® headset has demonstrated the potential for beneficial effects in various cognitive and executive functions, including significant improvements in speech and language, attention, and memory. Here is a summary of studies that encompasses both peer-reviewed articles and research papers.

1. EFFECTS ON VOICE QUALITY

- FORBRAIN IS A POSSIBLE PREVENTATIVE TOOL THAT MAY REDUCE VOCAL FATIGUE AND ENHANCE VOICE PRODUCTION [1].
- FORBRAIN'S ALTERED AUDITORY FEEDBACK (AAF) TECHNOLOGY CAN POTENTIALLY IMPROVE VOICE QUALITY DURING NATURAL SPEECH IN INDIVIDUALS WITHOUT SPEECH DISORDERS [1]. THE DEVICE MODIFIES THE FREQUENCY SPECTRUM OF THE USER'S VOICE, IMPACTING PARAMETERS RELATED TO VOICE QUALITY [2].
- FORBRAIN®'S ALTERED-AUDITORY FEEDBACK (AAF) POTENTIALLY IMPACTS VOICE QUALITY AND SPEECH FLUENCY IN INDIVIDUALS WITH PERSISTENT DEVELOPMENTAL STUTTERING [2]. THE DEVICE MODIFIES ACOUSTIC PARAMETERS RELATED TO VOICE QUALITY, SUGGESTING APPLICATIONS FOR SPEECH FLUENCY IMPROVEMENT [3].

→ Related study:

1. Nudelman et al. Reducing Vocal Fatigue with Bone Conduction Devices: Comparing Forbrain and Sidetone Amplification. *Published in:* Journal of Speech, Language, and Hearing Research • ePub Ahead of Issue • 1-18 • October 2023

This study aimed to compare the effects of two bone conduction devices that provide altered auditory feedback (AAF) on vocal fatigue and acoustic voice parameters. The two devices were the Forbrain device and a modified Forbrain device that provides only sidetone amplification. The study also included a control condition with no device.

Twenty participants participated in a vocal loading task using the two devices and the control condition. They rated their vocal fatigue on a visual analog scale every 2 min during the vocal loading task. Additionally, pre- and post-loading voice samples were analysed for acoustic voice parameters.

The results showed that **the use of both bone conduction devices resulted in lower vocal fatigue** when compared to the control condition with no feedback. During the pre- and post-voice samples, the sound pressure level decreased significantly during feedback conditions. During feedback conditions, spectral mean and standard deviation significantly decreased, and spectral skew significantly increased.

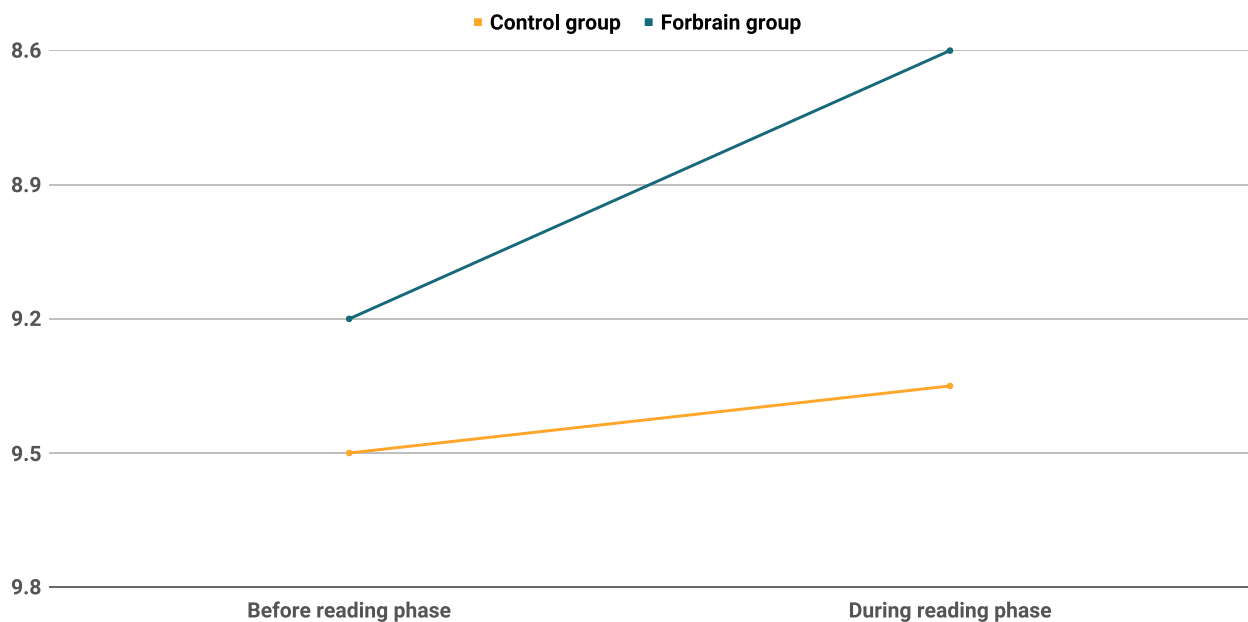
The authors concluded that **the results promote Forbrain as a possible preventative tool that may reduce vocal fatigue and enhance voice production.**

2. Escera et al. The Potential Effect of Forbrain® as an Altered Auditory Feedback Device. *Published in:* Journal of Speech, Language, and Hearing Research • ePub Ahead of Issue • 1-18 • October 2023

The study investigates the impact of Forbrain®, a newly introduced device utilizing bone conduction technology for auditory feedback during speech, on voice quality in natural speech. The objective is to determine whether Forbrain® affects the voice quality of individuals without speech disorders. The experiment involves comparing the effects of using Forbrain® with a control condition where the device is inactive. Thirty-two participants without speech-related disorders were divided randomly into an experimental group (using Forbrain®) and a control group (not using Forbrain®).

Forbrain® employs a dynamic two-band equalizer filter to modify the frequency spectrum of the user's voice during speech. Participants read aloud while wearing the Forbrain® headset in different phases: baseline, Forbrain® use, and post-use. Acoustic parameters were measured to evaluate voice quality.

Voice Robustness during Reading Phase (CPPS)



Escera et al. The Potential Effect of Forbrain® as an Altered Auditory Feedback Device.

Results reveal that Forbrain® significantly influences specific acoustic parameters related to voice quality. The use of Forbrain® leads to changes in smoothed cepstral peak prominence (CPPS), harmonics-to-noise ratio (HNR), and the tilt of the long-term average spectrum (tLTAS) during speech. Notably, the tLTAS parameter suggests improved voice quality during the brief Forbrain® use (14 minutes).

The findings suggest that **Forbrain® can potentially impact voice quality during natural speech in individuals without speech disorders**. It is indicated that the device provides Altered Auditory Feedback (AAF) to users. Consequently, **Forbrain® might offer a cost-effective option for AAF-based treatments in speech, language, and communication disorders**. Further research involving populations with speech disorders and clinical settings is needed to verify its therapeutic effectiveness.

3. Escera et al. The potential use of Forbrain® in stuttering: A single-case study. *Published in: Anuario de Psicología, Volume 48, Issue 2, 2018, Pages 51-58*

This study aimed to assess the effects of using a device called Forbrain® on the voice quality of an adult with persistent developmental stuttering. The participant was a **25-year-old man** with a history of stuttering and moderate symptoms. The device, Forbrain®, claims to provide Altered Auditory Feedback (AAF) and was evaluated for its impact on the participant's voice during reading tasks.

The study followed a single-case design and was conducted over 6 consecutive days. The participant read aloud a text in 3 different phases: baseline (without the device), test (with the device turned on), and post-test (device turned off). The study recorded various acoustic parameters from the participant's voice during these phases.

The analysis of the data revealed significant effects of using Forbrain® on certain acoustic parameters related to voice quality.

These findings suggest that Forbrain® had specific and transient effects on voice quality. The changes observed in the trendline of the long-term average spectrum (tLTAS) and the smoothed cepstral peak prominence (CPPS) indicate alterations in voice robustness and harmony, respectively.

The study demonstrates that using Forbrain® **can impact voice quality in an adult with stuttering**. This suggests **potential applications for speech fluency improvement**.

2. EFFECTS ON READING SKILLS, COMPREHENSION AND DYSLEXIA

- FORBRAIN® HAS THE POTENTIAL TO SIGNIFICANTLY IMPROVE BOTH THE SKILLS AND PROCESSES INVOLVED IN READING [4-7].
- FROM PRIMARY SCHOOL STUDENTS TO INDIVIDUALS WITH READING DIFFICULTIES LIKE DYSLEXIA, THE DEVICE OFFERS A MULTIFACETED APPROACH TO ENHANCING READING ABILITIES, ULTIMATELY CONTRIBUTING TO IMPROVED LITERACY AND COMMUNICATION OUTCOMES [4-7].

2A. READING SKILLS (STUDENTS WITH READING DIFFICULTIES)

Sound therapy using the Forbrain® headset can be an effective intervention for improving reading skills in students with reading difficulties [4]. The therapy enhances auditory discrimination and processing, ultimately leading to improved reading abilities [4].

2B. READING SKILLS (STUDENTS)

Forbrain® enhances the relationship between letters and their corresponding sounds, aiding reading comprehension and learning in diverse language components [5]. Its use potentially leads to improved phonological aspects in reading [5].

2C. READING PROCESSES

Forbrain® enhances the relationship between letters and their corresponding sounds, aiding reading comprehension and learning in diverse language components [6]. Its use potentially leads to improved phonological aspects in reading [6].

2D. DYSLEXIA

The Forbrain® headset, combined with adapted training, shows promising outcomes for reading accuracy, reading speed, working memory and verbal short-term memory in dyslexic patients [7]. The combined effect may offer new treatment strategies for written comprehension in dyslexia [7].

→ **Related studies:**

4. Torabi et al. The effect of sound therapy on reading skills of students with reading difficulties.

Published in: Journal of Garmian University Vol.5, No.3 (July, 2018)

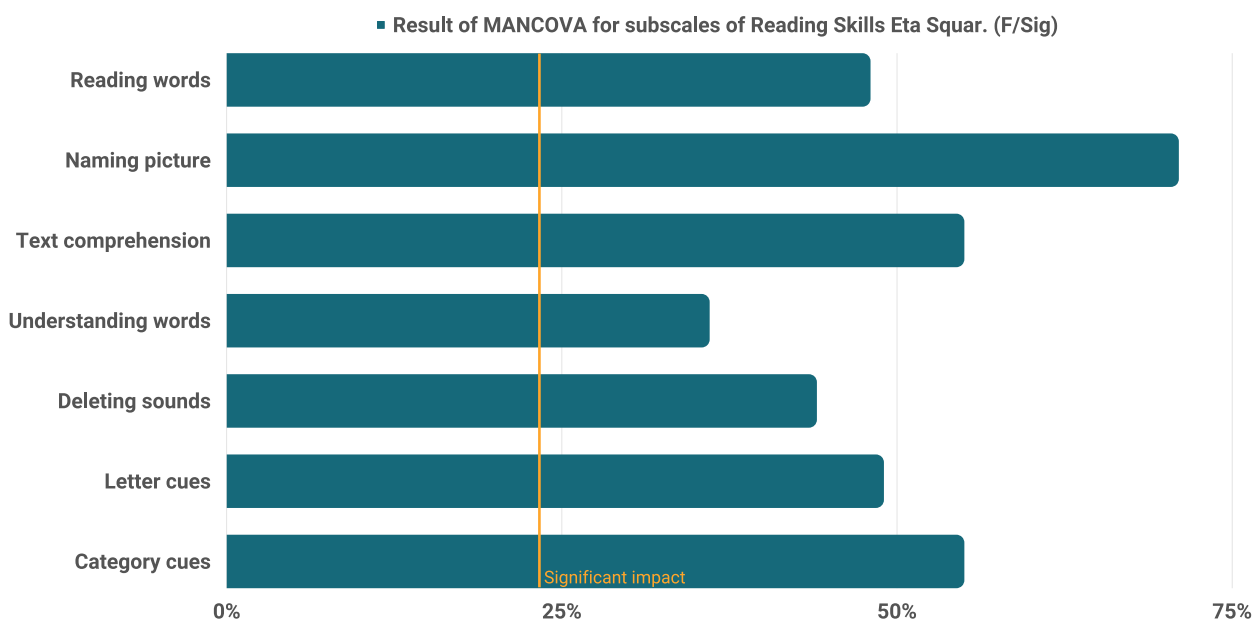
The study titled "The Effect of Sound Therapy on Reading Skills of Students with Reading Difficulties" aimed to assess the impact of Forbrain on improving reading skills among students facing reading difficulties. The study was concluded using a quasi-experimental design with pre-post test and control groups. The participants were **20 third-grade students** selected from an elementary school, who were randomly assigned to either the experimental group or the control group.

The intervention group received 20 sessions of sound therapy with Forbrain, while the control group did not receive any intervention. The participants' reading skills were assessed using the Reading & Dyslexia Test before and after the intervention.

The results indicated a significant improvement in the reading skills of the experimental group compared to the control group. Specifically, there were significant improvements in various reading skills.

The study suggests **that Forbrain® can have a positive impact on the reading skills of students with reading difficulties.** This could potentially be a promising avenue for educational interventions to help students overcome challenges related to reading difficulties.

Reading skills: Level of impact of Forbrain after 20 sessions (2x15min each) Vs Control Group



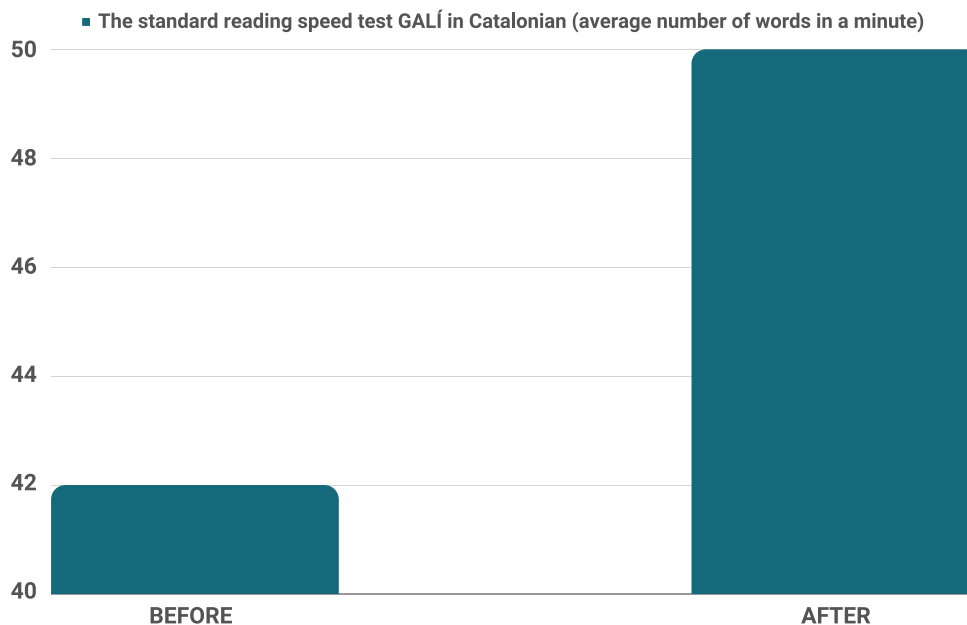
Torabi et al. The effect of sound therapy on reading skills of students with reading difficulties.

5. Forbrain® improves reading speed and comprehension. Published in: Mediterrani de La Ampolla School (in Tarragona)

A study conducted at the Mediterrani de La Ampolla School aimed to evaluate the effectiveness of Forbrain® in enhancing reading speed and comprehension. The study involved 8 primary school students over a two-month period, with four weekly sessions using Forbrain®. The participants were from various grades and backgrounds, including those with attention deficit issues. The study concluded that Forbrain® had a positive impact on students' academic performance, phonological awareness, oral expression, diction, fluency, memory and attention. The program effectively improved reading skills and processing information for all participating students.

Based on the standard reading speed test GALI, results show a significant increase of number of words read per minute. In addition, the group decreased their average rate of mistake in a minute from 9,5 to 7%.

Reading Speed and Comprehension after 20 Forbrain sessions (15min each).



Forbrain® improves reading speed and comprehension. Mediterrani de La Ampolla School

6. Guerrero. Effect of the Use of Forbrain® in the Reading Processes (2015). *Published in:* International University of La Rioja (Spain). Research paper.

The researchers' objective is to study Forbrain®'s operation and its effects on reading processes. The research group's Text Comprehension test results indicate improved performance, particularly in a reduced usage time. While improvements are visible in reader performance, execution times for words, pseudowords, syntactic structures, and texts remain similar. **The Forbrain® device plays a role in enhancing the relationship between letters and their corresponding sounds. It also aids in reorganizing our awareness of speech sounds through plasticity in the auditory system.**

The bone and air pathways facilitate the modification of sounds, enhancing the ability to read and understand various language components. The study highlights **improvements in reading pseudowords, aiding corrective action and sound modification. This approach has led to improved comprehension and learning, particularly in phonological aspects.**

The research suggests that the effects of Forbrain®'s use can last for an extended period.

7. Lucas. Effects of Speech and Audiophonic Loop Training through the Forbrain® Headset on Reading Accuracy and Speed, as well as Working Memory and Verbal Short-Term Memory in Dyslexic Patients: A Multiple Case Study (2022). *Published in:* Research paper.

The study aimed to investigate the effects of using the Forbrain® headset, combined with the adapted training by Torabi et al. (2018), on reading speed, reading accuracy, working memory, and verbal short-term memory in two dyslexic patients.

The results indicate some promising outcomes. The use of the Forbrain® headset seemed to improve rea-

-ding accuracy in the 2 tested subjects, as they made fewer errors during post-protocol reading. This suggests potential implications for the treatment of written language disorders, provided the patient is comfortable with the headset. Additionally, all **4 subjects**, whether they underwent training with or without the Forbrain® headset, saw an increase in reading speed and improvement in working memory. The adapted training by Torabi et al. (2018) likely contributed to these improvements.

These findings, along with previous studies, suggest the possibility of studying the combined effect of the Forbrain® headset and the adapted training by Torabi et al. (2018) on written comprehension in dyslexic patients, potentially leading to new treatment strategies for these conditions.

3. EFFECTS ON AUDITORY SKILLS

THE FORBRAIN® AUDIO TECHNIQUE ENHANCES AUDITORY PERCEPTION IN STUDENTS, LEADING TO IMPROVED AUDITORY SKILLS. THIS TECHNIQUE COULD HAVE IMPLICATIONS FOR EDUCATIONAL INTERVENTIONS TO ENHANCE PHONOLOGICAL AWARENESS, DICTION, FLUENCY AND ATTENTION [8].

→ **Related study:**

8. Mourid et al. The effectiveness of the auditory technique (Forbrain®) in the development of auditory perception.

The study aimed to assess the effectiveness of the Forbrain® audio technique in enhancing auditory perception. The research involved **14 male and female fourth-grade students**, selected using stratified random sampling. The students were divided into experimental and control groups, with similar characteristics. An auditory perception test with 30 items was designed to evaluate five auditory skills. The test's validity and reliability were established. The Forbrain® technique was applied to the experimental group while the control group received the usual method.

The study findings revealed **significant differences in the post-test auditory perception scores between the experimental and control groups, favoring the experimental group.** As a result, the researcher presented recommendations and suggestions based on the study outcomes.

4. EFFECTS ON COGNITIVE DYSFUNCTIONS (ATTENTION, MEMORY AND LANGUAGE)

- STUDIES INDICATE THAT FORBRAIN® BRAIN COGNITIVE TRAINING CAN EFFECTIVELY IMPROVE COGNITIVE FUNCTIONS SUCH AS ATTENTION, MEMORY AND LANGUAGE, IN PATIENTS WITH COGNITIVE DYSFUNCTION [9-12].
- THE TRAINING STIMULATES BRAIN AREAS RESPONSIBLE FOR COGNITIVE FUNCTIONS, LEADING TO NEW NEURAL PATHWAYS AND COGNITIVE REHABILITATION [9-12].
- FORBRAIN® THERAPY, COMBINED WITH STANDARD TREATMENT, SHOWS PROMISE IN REDUCING COGNITIVE IMPAIRMENTS AND IMPROVING PSYCHO-EMOTIONAL WELL-BEING IN PATIENTS WITH CHRONIC CEREBRAL ISCHEMIA [13].

→ Related studies:

9. Shuxing et al. Nursing Effect of Forbrain® Brain Cognitive Training on Cognitive Dysfunction among Patients with Stroke. *Published in:* Medicine and Philosophy, June 2017, Vol. 38, No. 6B, Total No. 575

The study conducted by Li Shuxing et al. aimed to investigate the effects of Forbrain® brain cognitive training on cognitive dysfunction among stroke patients. A total of **120 stroke patients** with cognitive dysfunction were divided into 3 groups: experimental group 1, which received Forbrain® cognitive training in addition to routine rehabilitation; experimental group 2, which received non-standard Forbrain® cognitive training; and the control group, which received routine rehabilitation only. The study used the Montreal Cognitive Assessment Scale (MoCA) to assess cognitive functions before and after a 10-week intervention.

Results indicated that experimental group 1, which received standard Forbrain® cognitive training, showed significant improvements in various cognitive aspects, including visuospatial construction, attention, memory, language, abstract thinking and total cognitive score, compared to both experimental group 2 and the control group. Experimental group 2 showed improvements in some cognitive aspects but not as consistently as experimental group 1. The control group also demonstrated improvements in cognitive functions after routine rehabilitation.

The researchers concluded that **Forbrain® brain cognitive training, was effective in improving cognitive function among stroke patients.** The training's mechanism of action was suggested to involve enhanced stimulation of brain areas responsible for attention, memory, language, and more, resulting in the establishment of new neural pathways and cognitive rehabilitation.

The study suggested that Forbrain® cognitive training could be **a valuable intervention for stroke patients with cognitive dysfunction**, but further research with larger sample sizes and refined grouping techniques is needed to confirm and expand upon these findings.

10. Jinju et al. Speech-auditory feedback training on cognitive dysfunctions in stroke patients. *Published in:* Chinese Journal of Behavioral Medicine and Brain Science, June 2017, Vol.26, No.6

The study conducted by the North China University of Science and Technology aimed to investigate the effects of speech-auditory feedback training on cognitive dysfunctions in stroke patients. The study utilized Forbrain®, a device for cognitive training based on dynamic processing of human voice and

auditory integration. A total of **120 stroke patients** with cognitive dysfunctions were divided into three groups: an experimental group 1 (received standard Forbrain® training), an experimental group 2 (received non-standard Forbrain® training), and a control group (received conventional rehabilitation).

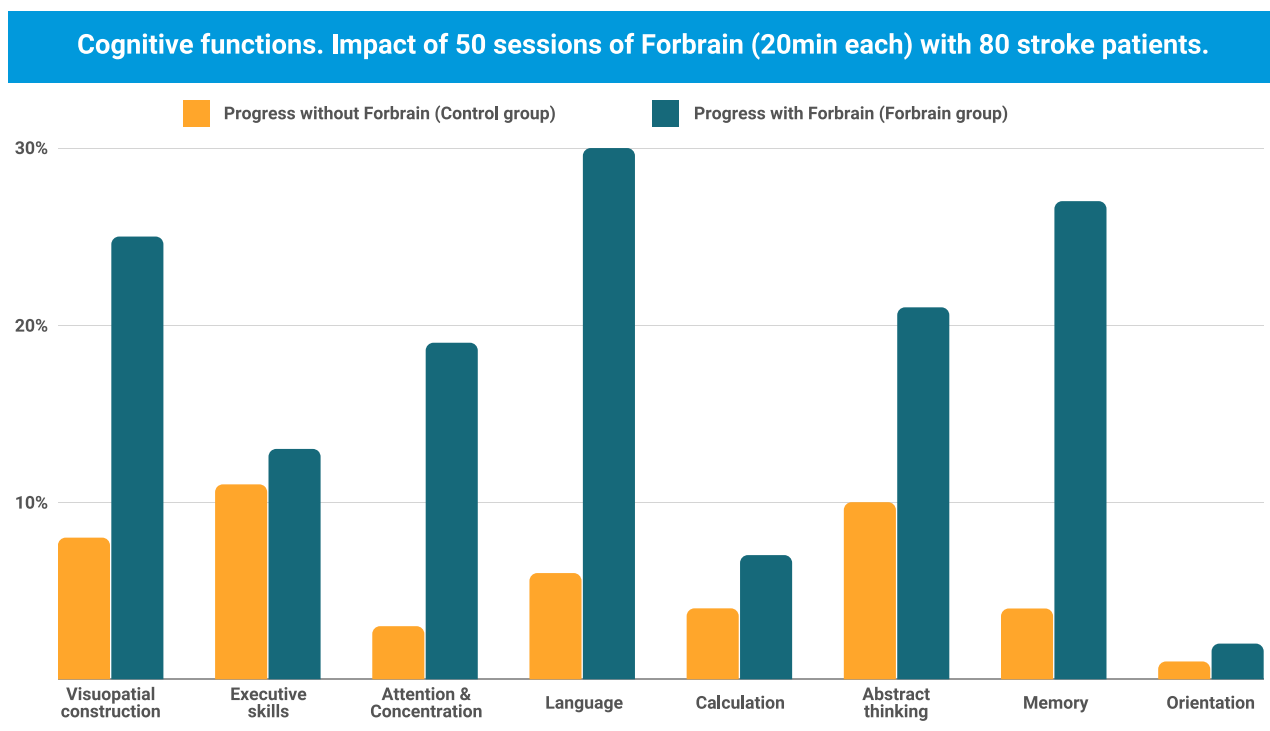
After a 10-week intervention, the researchers assessed the participants using the Montreal Cognitive Assessment scale (MoCA). The results showed that experimental group 1 exhibited higher scores in visuospatial construction, attention and concentration, memory, language, and the total MoCA score compared to experimental group 2 and the control group. The language scores in experimental groups 1 and 2 were also higher than those in the control group.

The study concluded that **speech-auditory feedback training using Forbrain® improved cognitive functions in stroke patients, particularly in areas related to attention, memory, language, and visuospatial skills.** The training's mechanism involved sensory integration, dynamic vocal processing, and auditory stimulation. This study suggested that **Forbrain® training could be a convenient and effective approach for rehabilitating cognitive functions in stroke patients.**

However, the study also acknowledged its limitations, including the sample size and the need for further research. The results indicated the potential benefits of speech-auditory feedback training for cognitive rehabilitation after stroke.

11. Jinju et al. Effect of Speech-Auditory Feedback Training on cognitive dysfunctions in stroke patients. *Published in: Shandong Medical Journal, 2017, Vol. 57, Iss. 26*

This study conducted at North China University of Science and Technology aimed to investigate the effects of speech-auditory feedback training on cognitive dysfunction in stroke patients. The experiment included **80 stroke patients** with cognitive dysfunction, divided into an experimental group (received speech-auditory feedback training) and a control group (received conventional rehabilitation). The intervention involved 20 minutes of Forbrain® speech-auditory feedback training per session, five sessions per week, for ten weeks in total. Participants were assessed using the Montreal Cognitive Assessment Scale (MoCA) and the Livingston Cognitive Assessment Scale II (LOTCA-II) before and after the intervention.



Jinju et al. Effect of Speech-Auditory Feedback Training on cognitive dysfunctions in stroke patients.

Results showed that the experimental group exhibited improved cognitive function compared to the control group. After the intervention, the experimental group demonstrated higher scores in various cognitive domains such as attention, concentration, visuospatial construction, language, abstract thinking, and memory on both the MoCA and LOTCA-II scales. The study suggested that **speech-auditory feedback training had a positive impact on cognitive functions in stroke patients**. The training was thought to stimulate brain regions related to language ability, attention, and concentration, and to facilitate neural recovery and compensation for cognitive impairments. The study highlighted **the potential of speech-auditory feedback training as an effective intervention for cognitive rehabilitation in stroke patients**.

12. Ping et al. Observation on Effects of Speech Auditory Feedback Training in Patients with PSCI.

Published in: Journal of Rare and Uncommon Diseases, Dec. 2018, Vol.25, No.6, Total No.131

The study aimed to investigate the effects of speech and auditory feedback training on patients with post-stroke cognitive impairment (PSCI). A total of 64 PSCI patients were divided into an observation group and a control group. The observation group received basic treatment, routine rehabilitation training, and speech auditory feedback training, while the control group received basic treatment and routine rehabilitation training.

The research found that after treatment, both groups showed significant improvements in cognitive function as measured by the Montreal Cognitive Assessment (MoCA) scale. The observation group had larger improvements in MoCA scores compared to the control group. Additionally, the levels of serum uric acid (UA) and neuron-specific enolase (NSE) decreased significantly after treatment in both groups, with a more significant reduction observed in the observation group. The Barthel Index (BI) scores, which assess activities of daily living, also increased significantly after treatment in both groups, with a greater improvement in the observation group.

The study suggests that **speech and auditory feedback training using Forbrain® equipment could effectively reduce serum UA and NSE levels, alleviate nerve cell damage, improve cognitive function, and promote the rehabilitation of PSCI patients**.

The research demonstrated that **incorporating speech and auditory feedback training into the rehabilitation regimen for PSCI patients has positive effects on cognitive function, serum biomarker levels and daily living activities**.

13. Usmanova et al. Innovative Forbrain® Therapy for Cognitive Disorders in Patients with Chronic Cerebral Ischemia. *Published in: Journal of Neurology and Neurosurgery Research Volume 1, Issue 4, 2020*

The study investigates the use of Forbrain® for patients with chronic cerebral ischemia (CCI), a condition characterized by reduced blood flow to the brain. CCI is a significant medical and social problem, often leading to cognitive impairments. The study included **60 patients** with CCI stages 1-2. Thirty of these patients received both standard therapy and sessions of the Forbrain® method, while the other thirty received only standard therapy.

The study evaluated patients' cognitive functions using the Mini Mental State Examination (MMSE) and their psycho-emotional state using the Beck Anxiety Inventory (BAI).

Results indicated that patients who received Forbrain® sessions along with basic therapy showed **greater improvements in their cognitive functions** compared to those who received only basic therapy. The total MMSE score increased significantly for the Forbrain® group, indicating **improved cognitive abilities**. Additionally, the Forbrain® sessions had a **positive impact on the psycho-emotional sphere of patients, reducing anxiety levels**.

The study suggests that **Forbrain® therapy, combined with standard treatment, can effectively reduce cognitive impairments and improve the psycho-emotional well-being of patients with chronic cerebral ischemia. This innovative method shows promise as an intervention for addressing cognitive and emotional challenges in these patients**.

REFERENCES

1. Nudelman et al. Reducing Vocal Fatigue with Bone Conduction Devices: Comparing Forbrain and Sidetone Amplification. [Journal of Speech, Language, and Hearing Research • ePub Ahead of Issue • 1-18 • October 2023](#)
2. Escera et al. The Potential Effect of Forbrain® as an Altered Auditory Feedback Device. [Journal of Speech, Language, and Hearing Research • Vol. 61 • 801–810 • April 2018](#)
3. Escera et al. The potential use of Forbrain® in stuttering: A single-case study. [Anuario de Psicología, Volume 48, Issue 2, 2018, Pages 51–58](#)
4. Torabi et al. The effect of sound therapy on reading skills of students with reading difficulties. [Journal of Garmian University Vol.5, No.3 \(July, 2018\)](#).
5. Forbrain® improves reading speed and comprehension. [Mediterrani de La Ampolla School \(in Tarragona\)](#).
6. Guerrero. Effect of the Use of Forbrain® in the Reading Processes (2015). International University of La Rioja (Spain). [Research paper](#).
7. Lucas. Effects of Speech and Audiophonic Loop Training through the Forbrain® Headset on Reading Accuracy and Speed, as well as Working Memory and Verbal Short-Term Memory in Dyslexic Patients: A Multiple Case Study (2022). [Research paper](#).
8. Mourid et al. The effectiveness of the auditory technique (Forbrain®) in the development of auditory perception. [Al-Araqa Foundation for Culture and Development](#)
9. Shuxing et al. Nursing Effect of Forbrain® Brain Cognitive Training on Cognitive Dysfunction among Patients with Stroke. [Medicine and Philosophy, June 2017, Vol. 38, No. 6B, Total No. 575](#)
10. Jinju et al. Speech-auditory feedback training on cognitive dysfunctions in stroke patients. [Chinese Journal of Behavioral Medicine and Brain Science, June 2017, Vol.26, No.6](#)
11. Jinju et al. Effect of Speech-Auditory Feedback Training on cognitive dysfunctions in stroke patients. [Shandong Medical Journal, 2017, Vol. 57, Iss. 26](#)
12. Ping et al. Observation on Effects of Speech Auditory Feedback Training in Patients with PSCI. [Journal of Rare and Uncommon Diseases, Dec. 2018, Vol.25, No.6, Total No.131](#)
13. Usmanova et al. Innovative Forbrain® Therapy for Cognitive Disorders in Patients with Chronic Cerebral Ischemia. [Journal of Neurology and Neurosurgery Research Volume 1, Issue 4, 2020](#)