International Journal of Social Science and Humanities
www.humanitiesjournals.com
Online ISSN: 2664-8628 Print ISSN: 2664-861X
Received: 05-05-2025, Accepted: 06-06-2025, Published: 20-06-2025
Volume 7, Issue 3, 2025, Page No. 35-38

Verbal recitation and brain development: Sanskrit effect

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Abstract
Are there any changes in the areas of brain due to verbal recitation? In verbal recitation, an individual involves in expressing a learn text in a systematic, rhythmic and organized manner. This paper attempts to review the relationship between verbal recitation and its impact on brain development. The review becomes necessary after a cognitive neuroscientist named James Hartzell's findings were reported. Hartzell stated that rigorously learning and memorizing certain mantra (specific vedic texts) and then reciting it enhances the size of the areas of the brain that are involved in cognitive functions such as memory. The review explains the effect of various texts such as Pradnyavivardhan Stotra Recitation, Amitabha Buddha and various others texts on the brains areas associated with memory, thinking and language. The characteristics and special features of Sanskrit language have also been discussed which could be contributing to the change in brain areas. The study finds the need of conducting empirical research to find out whether Sanskrit Effect is an effect of specific language or could be the effect of practicing verbal recitation that could be in any other language as well.

Keywords: Sanskrit effect, verbal recitation, brain development, memory, cognition

Introduction

Verbal recitation is also known as oral recitation which involves the act of speaking or reciting a certain learnt and memorized text aloud. Verbal recitation has traditionally been a way of preserving the ancient knowledge which was transmitted verbally through generations. In the process of verbal recitation, the practitioner expresses thoughts and ideas in an organized manner. Verbal recitation is evident in various educational setting where poem recitation and storytelling are some of the prominent practices. In religious settings also, verbal recitation is practiced extensively. The process of memorizing a certain text can increase in the size of those areas of brain that are associated with cognitive functions. Sanskrit practitioners develop the capability to orally memorize and recite the Sanskrit texts; the length of which range from hundreds to thousands words. Some practitioners memorize larger texts of more than 40,000 to 100,000 words. The ancient traditional learning system of India has always emphasized the oral memorization of the Vedic texts. Various researchers have remained curious to study the effect of such intense verbal memory training on the physical structure of brain.

A cognitive neuroscientist James Hartzell witnessed these practitioners called pandits reciting these mantras without pause or error in which every word of the recitation was clearly heard. It was also accompanied by the synchronous movement of the right arms of all the pandits. The pitch and the accent of the recitation were so hypnotic that the sound was reverberating through the room. (Hartzell, 2018) [8]. The research question that emerged is that does memorize and reciting ancient texts or mantras have any effect on memory, thinking and cognitive capabilities.

According to James Hartzell:

'I had also noticed that the more Sanskrit I studied and translated, the better my verbal memory seemed to become'. (Hartzell 2018) [8].

Sanskrit Effect

Hartzell wanted to check whether there is any effect of such memorization and recitation of Sanskrit mantras on the brain structure and cognitive capabilities. Hartzell conducted an experimental research and analyzed the findings of his research work that he conducted on Sanskrit Pandits. In his research, it was found that those pandits who were proficient in chanting Sankrit mantra and were practicing and reciting those mantras regularly showed more development in certain areas of their brain. Such relationship between memorizing and reciting mantras and the brain parameters was termed as 'Sanskrit Effect'. It is important to understand the James Hartzell's research methodology and the findings in detail. The following objectives have been framed for this review.

Objectives

1. To understand the methodology of James Hartzell's research leading to identifying Sanskrit effect
2. To review the research work studying the relationship of verbal recitation and brain development
3. To discuss the specific characteristics of Sanskrit language to understand the reasons of Sanskrit effect
4. To review the research on the effect of multilingualism on cognitive functions

James Hartzell's Methodology

In the study conducted by Hartzell (2018) [8], professional Vedic pandits from government schools of Delhi region were recruited. The research was conducted under the India-Trento Partnership for Advanced Research (ITPAR) and the Magnetic Resonance Imaging (MRI) scans of the brains of pandits were done at National Brain Research Centre (NBRC). The objective of the research was to see the effect of memorizing ancient Sanskrit mantras on the brain grey matter density and thickness of cerebral cortex. It was found that various regions of the brains of the pandits were dramatically larger than those in the control group. The control group consisted of the subjects with same age,

gender, handedness and multilingualism. This also proves that practicing Vedic mantra cause growth in certain brain areas. Increases in these brains area have been associated with improved cognitive functions in various researches.

The study was conducted by forming two groups. The first group consisted of 21 male participants with no previous learning history of ancient mantras. This was the control group' which had no intervention of any professional training, memory or recitation practice of Yujurveda Samhita text The second group consisted of 21 participants who have received professional training to learn Vedic mantras written in Sanskrit language. The participants in the second group had memorized the Yajurveda Samhita text. These participants were part of the experimenta group which included Vedic Sanskrit Pandits who were trained since their childhood and have memorized, recited and got mastery over the exact pronunciation of the Yajurveda Samhita text.

The study found that in the second group, the brain of Vedic Sanskrit Pandits showed increase in brain's grey matter density and thickness of cerebral cortex. These changed were reported to the areas of brain which is involved in functions related to language, memory and visual systems. The areas of Hippocampus, a part of brain, also showed massive increase among the Sanskrit Pandit's MRI scans.

The area of the brain associated with verbal memory is hippocampus which plays an important role in formation of memories, both short term and long term. The pandits have more gray matter in the area of hippocampus. The brains of these pandits also showed more thickness in the right temporal cortex which is found to be associated with speech prosody and voice identity. (Hartzell, 2018) [8].

Although the researchers could not conclude that the changes that have occurred in the brains of the Sanskrit pandits were due to the learning of specific text in Sanskrit language or the changes were due to formation of memory and recitation of such a large text. Further researches are needed to draw more conclusions specific to learning and recitation of Sanskrit language.

Effect of Chanting Mantras: Cross-Cultural Universality

Ghaligi, Nagendra, Bhatt and Vivekanand (2006) [6], compared two groups, one group was involved in Vedic chanting and the other was not involved in Vedic chanting. It was found that the group which was involved in the Vedic chanting showed increased scores on memory tests. The study considered Vedic chanting as a meditative practice enrooted in rich traditions of Indian spiritual practices. Ghaligi *et al.* (2006) [6]. also found that skin resistance also decreased in the group which practiced mental repetition of 'om'.

Kamath (2016) [10]. conducted a study to study the effect of Aum chanting on depression, anxiety and some other cognitive abilities. She selected some elderly women who were suffering from hypertension. In this research, recitation is found is to be associated with more supply of oxygen. The recitation of stotras also involves rhythmic deep breathing in a systematic manner; such breathing practice brings more oxygen supply to the brain and improves abilities such as concentration, calmness, attention etc.

Bhatt and Gupta (2013) [2]. also studied the effect of Aum chanting on the level of stress. They found that regular chanting of Aum provided relief from stress and the subjects became more relaxed. Another research by Kori (2017) [11]. studied the effect of chanting OMKARA mantra on pulse rate and found the chanting effective in improving pulse rate.

Narayanan & Venogopalan (2018) [13], conducted a study to understand the effect of Gayatri Mantra chanting on cognitive functions. They selected 30 students aged 11-14 years who were provided training to chant Gayatri Mantra for a week. After that, these students started chanting the mantra for 16 weeks under the supervision of a Vedic expert. It was found that both verbal memory and spatial memory scores increased significantly after the 16-week duration of Gayatri mantra chanting.

Gurjar, Ladhake & Thakare (2011) [7]. also concluded that due to the effect of repeated chanting of OM, the mind becomes calmer; breath becomes smoother, and leads to stabilization of brain. They also stated that chanting is helpful in removing worldly thoughts and in shifting our attention. They considered chanting mantras a form of energy medicine for those who were under stress.

Effect of Pradnyavivardhan Stotra Recitation

Mora, Kakade, Sonwane, Deshmukh and Pangul (2021) studied the effect of practicing Pradnyavivardhan Stotra on memory and mental ability. Pradnyavivardhan Stotra is a Sanskrit text from Skand Purana, this text is a description of different names for worshipping Lord Kartikeya. Pradnya means wisdom and vivardhan means empowering; hence the verbatim meaning of Pradnyaivardhan is that the recitation of this Stotra is useful for empowering or developing wisdom. The researchers in this study made two groups; one control and one experimental group. The participants in the experimental group went through a guided recitation of Pradnyavivardhan Stotra for 150 days. On each day, this Stotra was recited 11 times. The participants were pre-tested and post-tested (before and after the 150 days' recitation of Stotra) on various aspects of mental ability. The subjects in the experimental group, which had practiced the recitation of Pradnyavivardhan Stotra, scored significantly higher on various mental abilities than the control group which did not practice the Stotra. The researchers have encouraged the use of chanting of Stotra mantras. It also recommended a registered clinical trial which uses randomized control study design on Vedic mantras for obtaining more add-on evidences.

Gao, Leung, Yan & Sik (2019) [4]. studied the effect of chanting Buddha Amitabha which is a form of religious chanting in which an individual focus on chanting the Buddha's names repeatedly which helps the practitioner remain calm and concentrate on the Buddha. Buddha Amitabha can be performed in different languages including Prakrit, Sanskrit, Chinese and Japanese. It was found by the researchers that such chanting increased delta wave activity in the certain areas of the brain denoting beneficial effects on biological and cognitive domains of an individual.

According to Jianbin and Mehta (2003) [9]. 's research they conducted in Singapore, long-term regular chanting of Amitabha Buddha proves to be an effective technique of meditation and elicits experiences that are transcendental in nature and provides blissfulness to an individual.

Gao *et al.* (2017) [5]. studied the neural mechanisms underlying chanting and praying the names of the Buddha on brains' response to fear and stress provoking pictures. They analyzed electroencephalogram (EEG) data of 21 Buddhists who were chanting while they were exposed to

negative and neutral pictures. They found that chanting might help the participants to neutralize the effect of negative stimuli. They also stated that their findings were similar to the obtained in some similar researches conducted in Christian religious practices.

Benefits of Sanskrit language

Sanskrit is called as the world language. It does not have any variations in local dialects and is used uniformly irrespective of geographical location. Sanskrit has remained a choice for poetic expression in literature due to its rhythmic pronunciation. Sanskrit has only one set of alphabet with a close connection with what is written and what is spoken. The words are not pronounced differently than what is written as is evident in some other languages. Sanskrit also has phonetic script which is learnt sequentially in a logical and easy-flowing manner. The possibility of Sanskrit having effect on the brain is also supported by some specific characteristics and parameters of Sanskrit. Sanskrit language itself differs from other language in many aspects such as the sounds of Sanskrit, its rhythmic pronunciation etc. Resonance or vibrations in the sounds while one recites Sanskrit words is also its uniqueness.

Sanskrit is considered as a grammatically perfect language which needs lesser words to express the same sentence written in English or Hindi with more words. Learning Sanskrit is an ideal gateway to learning some other Indian or Indo-European languages. Mishra (2014) [12]. has emphasized that Sanskrit schooling has demonstrable influence on cognitive and social processes of children. It influences their learning, memory, spatial language, meta-cognition and many other abilities.

Effect of Multilingualism

Languages are not simply a tool for conversation but also provide us the gateway to learn about people from diverse cultures and traditions. A child, as grows to adulthood, acquires language in which one learns new words, concepts, its meanings, interpretations in various contexts which ultimately help in developing one's cognitive framework. It is important to understand whether learning multiple languages lead to more cognitive stimulation and improved performance on various cognitive parameters.

According to a research conducted by Bak and Allerhand (2014) [1], the younger adults who had learn two languages and obtained proficiency in two languages, referred to as bilinguals, had better ability to concentrate and their attention was also better than monolinguals, the adults who were proficient in one language only. In this research, Dr Thomas Bak studied various intellectual and cognitive abilities of some participants at two different time periods. The first set of scores were obtained when these participants were of 11 years age, this assessment was done in the year 1947. The second set of scores were obtained when these participants were in their early 70s age, this assessment was done between the years 2008-2010. In between 1947 to 2008-10, some of these participants learn two languages whereas some learn only one language. The researchers concluded that bilinguals performed better than expected on various parameters such as general intelligence, concentration and attention in comparison to the monolinguals. The research proved that learning more languages lead to development of better cognitive capabilities.

Conclusion

The review of the available literature on effect of memorizing and reciting religious mantras, stotras and prayers has been very popular religious practices since ages. Its effect on the anatomy of the brain, development of grey matter of specific areas of brain has been discussed. These practices are found to be associated with lowering negative emotional states and also provide benefits in regulating one's breath, make an individual calmer by keeping the breath in a rhythmic pattern. It also improves the flow of energy in the body and is associated with mental and physical well-being. Such findings have been obtained in various cultures which indicate a cross-cultural universality of the effect of chanting mantras. The effects of various languages, its acquisition, memorization, recitation on different parts of the brain have been confirmed. Sanskrit language is considered very systematic and scientific language. More interdisciplinary researches have been recommended combining Sanskrit, Medical and Behavioral sciences to obtain more evidences in the favor of Sanskrit Effect.

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