



Review

The musical centers of the brain: Vladimir E. Larionov (1857–1929) and the functional neuroanatomy of auditory perception[☆]

Lazaros C. Triarhou^{a,*}, Tatyana Verina^b^a Laboratory of Theoretical and Applied Neuroscience and Graduate Program in Neuroscience and Education, University of Macedonia, Thessalonica 54636, Greece^b Formerly, Department of Neurology and Developmental Medicine, Hugo W. Moser Research Institute at Kennedy Krieger Institute, and Department of Environmental Health Sciences, Johns Hopkins University Bloomberg School of Public Health, Baltimore, MD 21205, USA

ARTICLE INFO

Article history:

Received 2 April 2016

Received in revised form 12 June 2016

Accepted 12 June 2016

Available online 16 June 2016

Keywords:

Auditory cognitive neuroscience

Cortical localization

Music perception

Temporal lobe tonotopy

Vladimir M. Bekhterev (1857–1927)

ABSTRACT

In 1899 a landmark paper entitled “On the musical centers of the brain” was published in *Pflügers Archiv*, based on work carried out in the Anatomico-Physiological Laboratory of the Neuropsychiatric Clinic of Vladimir M. Bekhterev (1857–1927) in St. Petersburg, Imperial Russia. The author of that paper was Vladimir E. Larionov (1857–1929), a military doctor and devoted brain scientist, who pursued the problem of the localization of function in the canine and human auditory cortex. His data detailed the existence of tonotopy in the temporal lobe and further demonstrated centrifugal auditory pathways emanating from the auditory cortex and directed to the opposite hemisphere and lower brain centers. Larionov's discoveries have been largely considered as findings of the Bekhterev school. Perhaps this is why there are limited resources on Larionov, especially keeping in mind his military medical career and the fact that after 1917 he just seems to have practiced otorhinolaryngology in Odessa. Larionov died two years after Bekhterev's mysterious death of 1927. The present study highlights the pioneering contributions of Larionov to auditory neuroscience, trusting that the life and work of Vladimir Efimovich will finally, and deservedly, emerge from the shadow of his celebrated master, Vladimir Mikhailovich.

© 2016 Elsevier B.V. All rights reserved.

Contents

1. Introduction	144
1.1. Perspectives in cortical tonotopy and the auditory centers	145
1.2. Cortical tonotopy and conditioned reflexes	149
1.3. Distinct pathways for language and music in the brain	150
1.4. Hearing deficits in psychotic conditions	151
1.5. Other works	152
2. Discussion	155
3. Summary	158
Acknowledgment	158
References	159

[☆] The article highlights the academic life and research career of the physician Vladimir E. Larionov (1857–1929), a close associate of the renowned neurophysiologist Vladimir M. Bekhterev (1857–1927). With his experiments on dogs, and by observing clinical cases of aphasia in humans, Larionov solidified the concept of tonotopy in the temporal lobe. His pioneering work further includes the demonstration of centrifugal pathways from the auditory cortex to the contralateral cerebral hemisphere and to lower centers of the brainstem.

* Corresponding author at: University of Macedonia, 156 Egnatia Ave., Thessalonica 54636, Greece.

E-mail addresses: triarhou@uom.gr (L.C. Triarhou), tverina@yahoo.com (T. Verina).

1. Introduction

Advances in auditory neuroscience were made toward the end of the 19th century. Studies on the structure and function of the auditory and vestibular brain systems published since the 1880s by Hermann Munk (1839–1912) in Germany, Vladimir M. Bekhterev (1857–1927) in Russia, and others, have provided the biological foundations for the evolution of “otoneurology” as a neurological discipline (Arkhangelsky, 1984).

A Russian pioneer in the morphology and physiology of the cortical auditory system was Vladimir Efimovich Larionov (1857–1929). His work is largely forgotten, save the occasional mention by a small number of neuroscientists, historically versed. For example, the British-American physiologist Mary A. B. Brazier (1904–1995) of the University of California, Los Angeles (Brazier, 1960), the German-American electroencephalographer Ernst Niedermeyer (1920–2012) of Johns Hopkins University (Niedermeyer, 2005), and the New Zealander-American neuroanatomist Edward G. Jones (1939–2011) of the University of California, Davis (Jones, 2011), cited Larionov’s experiments in their writings, as has the psychologist Stanley Finger of Washington University in his narrative of explorations into brain function, in a chapter on audition and the central nervous system (Finger, 1994). Niedermeyer (2005), in particular, used the phrase, “Vladimir Efimovich Larionov conducted beautiful studies of the auditory cortex in the dog.”



Fig. 1. Upper: Vladimir M. Bekhterev, in the center, among his closest colleagues in the Department of Psychiatry at Kazan University. Photo from the introductory matter in the 40-year Bekhterev Festschrift (cf. Larionoff, 1926). Lower: The Imperial Military-Medical Academy of St. Petersburg, circa 1895–1900. (Credit: Library of Congress).

Biographical sources on Larionov are scanty. A brief résumé concludes his doctoral dissertation (Larionov, 1898e). Beyond that, there is one Russian article referenced in Medline (Arkhangelsky, 1984), and a concise entry in the Encyclopedia of Modern Ukraine (Vasilyev, 2015).

A contemporary of Bekhterev (Fig. 1, upper), Larionov was born in Stavropol on September 19, 1857 (September 7 in the old-style Julian calendar). His father was a practicing physician and chief officer in Kazan. Russian Orthodox in creed, Larionov attended the First Imperial Gymnasium of Kazan, from which he graduated in 1876. In the same year, he was admitted to the Faculty of Medicine of Kazan Imperial University, from which he graduated in 1881.

In 1882 he began his military service as a physician at the Military-Medical Directorate of the Kazan District, being frequently seconded to the Kazan Military Hospital. During that period, he wrote several reports on organizational issues in military medicine (Arkhangelsky, 1984). Beginning in 1890, he specialized in otorhinolaryngology and became interested in the mechanisms of skull fractures; he published two papers (Larionov, 1891, 1897b), in which he attempted to interpret the type and location of such fractures on the basis of the principles of mechanics.

In 1893 Larionov obtained a Doctorate of Medical Science from Kazan University and was appointed senior physician at the 37th Dragoon Regiment (Larionov, 1898e; Arkhangelsky, 1984; Vasilyev, 2015). In 1895 he became senior registrar at the Military Hospital of Novogeorgiyevsk (today Svitlovodsk, Ukraine), whence he was seconded to the Military Medical Academy for the Advancement of Sciences. The following year, Larionov described a Menière-type syndrome when the Eustachian tubes are obstructed (Larionov, 1896). Until then, Menière syndrome was associated in the literature with purulent processes in the inner ear, and with hemorrhage in the semicircular canals and ear cerumen. At the conclusion of his article, Larionov was one of the first Russian physicians to describe diagnostic signs of the semicircular canals. He wrote:

If suffering from the upper vertical canal, the dizziness is back to front or vice versa. If suffering from the outer horizontal anteroposterior canal, the dizziness will be about the axis of the body. When suffering from low posterior cross canal, the dizziness will be toward the affected side, that is, as if the head is leaning and the floor lowering from the affected side, while on the contralateral side, the floor will be as if rising. If the patient lies on the affected side, the head will feel like being lowered and the feet rising; and if the patient lies on the unaffected side, then it would appear as if the head is rising and the legs are lowered (Larionov, 1896; Arkhangelsky, 1984).

Larionov completed his doctoral dissertation (Fig. 2, left) in the Anatomy and Physiology Laboratory of the Clinic for Nervous and Mental Diseases directed by Bekhterev in St. Petersburg and successfully defended it at the Imperial Military-Medical Academy (Fig. 1, lower) on April 9, 1898 (Larionov, 1898e).

The opponent committee at the thesis defense comprised Bekhterev, the otorhinolaryngologist N. P. Simanovsky, and the psychiatrist A. F. Erlitsky. In his evaluation, Simanovsky emphasized the importance of Larionov’s data, and noted that it is impossible to explain human brain activity based on experimental data from animals alone. Bekhterev, in his statement, highlighted the fundamental importance of Larionov’s work, as it demonstrated that, in the auditory cortex, there is a specific arrangement for the perception of different pitches, as is the case for visual cortical areas (Arkhangelsky, 1984).

In his résumé, Larionov listed 13 published scientific works—including papers on the relation of rhinitis to the occurrence of otitis, and on the course and treatment of catarrh of the middle ear—which witnessed his experience in otorhinolaryngology. He

Download English Version:

<https://daneshyari.com/en/article/1988712>

Download Persian Version:

<https://daneshyari.com/article/1988712>

[Daneshyari.com](https://daneshyari.com)