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LANGUAGE LEARNING AND BILINGUALISM IN THE NEUROSCIENTIFIC CONTEXT

The bilingualism and the process of language learning in their relation to the human brain and its activity have became one of the most debated issues in the cognitive science. The development of both neuropsychological and technical methods of speech studies (Functional Magnetic Resonance Imaging (FMRI) and event-related potential (ERP) in particular) has enabled scientist to identify specific characteristics of brain activity during a language learning and its bilingual and monolingual usage. Neural aspect of bilingualism is significant part of linguistic studies as it represents the material substratum of multilingual speech activity of each individual. All the social aspects are superimposed on this substratum and define variability of development and manifestation of common neurophysiologic and neuropsychological mechanisms. The relevance of the research is defined by the following facts: the economic and social issues are becoming global and foreign language learning at different ages is an essential task for almost each person. Both linguists and language teachers must turn to neurological areas in order to understand the nature of language acquisition and language processing. The particular neurolinguistics researches are analyzed and relevant conclusions for learning are made in this paper.

Language learning requires certain abilities which are closely related to the functions of the brain. These are: phonetic coding ability (to encode incoming sound signals for further storage in long-term memory that allows a person to keep the perceived sequence of sounds associated with a definite meaning content); grammatical sensitivity (to define interdependency between lexical units in a sentence and to define their syntactical functions); rote learning ability (to associate the expression with the meaning which are connected randomly, this skill provides vocabulary enhancing); inductive language learning ability (to organize the empirical material and develop more general rules of the relevant linguistic material) [1]. What happens on the brain level? The exposure to unfamiliar speech sounds is initially registered by the brain as undifferentiated neural activity. Neural activity is diffuse, because the brain has not learned the acoustic patterns that distinguish one sound from another. As exposure continues, the listener (and the brain) learns to differentiate among different sounds. Neural connections that reflect this learning process are formed in the auditory (temporal) cortex of the left hemisphere for most individuals. With further exposure, both the simple and complex circuits (corresponding to simple sounds and sequences of sounds) are activated at virtually the same time and more easily. As connections are formed among adjacent neurons to form circuits, connections also begin to form with neurons in other regions of the brain that are associated with visual, tactile, and even olfactory information related to the sound of the word. Some of the brain sites for these other neurons are far from

the neural circuits that correspond to the component sounds of the words; they include sites in other areas of the left hemisphere and even sites in the right hemisphere. In early stages of learning, neural circuits are activated piecemeal, incompletely, and weakly. As exposure is repeated, less input is needed to activate the entire network. With time, activation and recognition are relatively automatic, and the learner can direct her attention to other parts of the task [2, p. 340].

Not less important is the fact that higher order brain centers that process complex, abstract information can activate and interact with lower order centers, as well as vice versa. For example, teaching students simple emotional expressions (vocabulary and idioms) can take place in the context of talking about different emotions and what situations elicit different emotions. Students' vocabulary acquisition can be enhanced when it is embedded in real-world complex contexts that are familiar to them.

Let consider special brain characteristic of people of different age while learning a second language. In case of early bilingualism the same neuropsychological mechanisms are responsible for simultaneous mastering of the first and the second language [3].This process stands for the most «free» usage of both languages in future. The monolinguals' and early bilinguals' structure of hemispheric interaction in the process of speech is similar. While in the process of further second language acquisition the left and the right hemispheres are involved differently ([4; 5]). In case of early bilingualism the ability of special sensitive phonemic hearing is developed, which helps to distinguish different ways of pronouncing and numerous accents. Late bilinguals and adult language learners while distinguishing the sounds of the speech use categorization mechanism, leveling all the irrelevant functional differences. For example, native Japanese speakers normally cannot distinguish between the English «r» and «l» sounds [6]. Studies suggest that as the language centers of our brain are mature, certain phonemes are «wired» into those brain centers. Phonemes that are not essential to the native language are not incorporated, implying that adult brains are simply less receptive to foreign phonemes. When presented with English words containing either of these sounds, brain imaging studies show that only a single region of a Japanese speaker's brain is activated, whereas native English speakers show different areas of activation for each sound. Learning to distinguish the phonemes might then actually require a «rewiring» of certain elements of the brain's circuitry.

Localization of semantic lexemes processing is the same for the first and the second language while starting to learn the second one in the age of eight (starting from systematic school-period learning). The same substratum of a pupil's brain is responsible for semantic processing of isolated words of the first language and the second language at the first stages of learning. While in case of starting to learn the second language when sixteen involves different cortexes in the processing of native and non-native speech [5]. A study by Kim K., Relkin N., Lee K., and Hirsch J. (1997) has shown that not only language elements are processed differently but also they are stored in different parts of the brain of those who are adult bilinguals, who started to learn the second language later than being ten. The investigators also assumed that the mother tongues are used implicitly. By contrast, a second language, particularly if learned in adulthood, is probably learned and used explicitly. It has to be pointed out that existing clinical and neuroimaging studies suggest that implicit

and explicit memory systems do rely upon different neural structures. The notion of «critical language learning period» is discussed by numerous linguists and varies from one to another. But the common hypothesis states that the learning before attaining the age of 16 is the most effective [7]. Because the percent of language mistakes provoked by interlingual interference is very high as the process of language usage depends largely on cognitive control of adult person [8].

The speech planning and generation of bilingual person causes more complex neural activity than of monolingual. When bilinguals are rapidly toggling back and forth between their two languages – that is, in «bilingual mode» – they show significantly more activity in the right hemisphere than monolingual speakers, particularly in a frontal area called the dorso-lateral prefrontal cortex (the source of the bilingual advantages in attention and control). In case of lexical conflict the brain of bilingual acts as in case of any other type of conflict (the dorsal prefrontal cortex and the anterior cingulated gyrus are involved). Thus larger brain resources are used. In the process of lexeme choice bilingual's brain acts as monolingual's one in the process of non-verbal unit choice. The later process apart from mentioned parts involves Broca's area and other parts of prefrontal cortex in case of bilingual. The brain flexibility of bilinguals causes numerous advantages in the overall cognitive activity. Moreover, early bilingualism protects the brain from rapid aging and provides larger amount of grey matter in parietal lobe. Having to distinguish between two languages can be tricky in some situations, but the brain's executive functions, especially the attention and inhibition processes, are strengthened through this process, ultimately making bilingual speakers better at switching between two tasks or handling tasks that require conflict management.

Increased understanding of the ways in which multiple languages are represented in bilingual speakers' brains is undoubtedly advancing several theoretical issues in areas such as language acquisition and performance theory. However, there is much experimental and clinical data in neurolinguistics which is clearly relevant, and very little work has been done on first or second language acquisition from the neurolinguistics perspective. It is my belief that knowledge of such issues can be useful not only to physicians and psychologists, but also to teachers in general. After all, teachers deal every day with one of the most typical features of the human brain, namely the ability to learn.

REFERENCES

1. Carroll J.B. Human Cognitive Abilities / J. B. Carroll. – USA, Cambridge, MA: Cambridge University Press, 1993. – 810 p.
2. Elman J. Rethinking innateness / Elman J., Bates E.A., Johnson M., Karmiloff-Smith A., Parisi D. – USA, Cambridge, MA: MIT Press, 1997. – 670 p.
3. Hamers K. Bilinguality and Bilingualism, 2nd edition / Hamers K., Josiane F., Michel H., Blanc A., – USA, Cambridge, MA: Cambridge University Press,Cambridge University Press, 2006. – 468 p.
4. Котик Б.С. Нейропсихологический анализ билингвизма / Б.С. Котик // Психологический журнал / Ред. А.В. Брушлинский, В.С. Шустиков, Л.И. Анцыферова. – 1988. – Том 9, №3 май-июнь 1988. – С. 139-148.
5. Vaid J. Neuropsychological perspectives on bilingualism: right, left, and center / Vaid J., Hall D.G., – USA, NY: Reynolds editors, 2009. – 345 p.

6. Aoyama K. Perceived phonetic dissimilarity and L2 speech learning / Aoyama K., James E., Guion S., Akahane Y., Reiko Y., Tsuneo F., Journal of Phonetics, volume 32. – Springer-Verlag New York, Inc., 2004. – P. 233 – 250.
7. Johnson J.S.Critical period effects in second language learning: The influence of maturational state on the acquisition of English as a second language. Cognitive Psychology / Johnson J.S., Newport E.L., – USA, Cambridge, MA: Cambridge University Press, 2012. – P. 60 – 99.
8. Festman J.Cognitive control in Russian–German bilinguals / Festman J., Münte T.F., – Spain, Granada: University of Granada Press, 2012. – 89 p.

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ПОРІВНЯЛЬНА ХАРАКТЕРИСТИКА ЛЕКСИЧНОГО ТА АСОЦІАТИВНОГО ЗНАЧЕННЯ КОНЦЕПТУ «ВАЛЮТА»

Поняття картини світу належить до числа фундаментальних понять, які виражають специфіку людського буття, відносини його зі світом. Картина світу – цілісний його образ, який є результатом усієї діяльності людини [1].

Концептуальна та мовна картини світу є відображенням у взаємопов'язаних формах – формі пізнавальної діяльності й формі мови – об'єктивної дійсності [10, с. 37]. Межа між мовною та концептуальною картинами світу є нечіткою, вони перебувають у логічних відношеннях перетину або включення першої до другої залежно від визнання концептуально не співвідносних мовних категорій [12, с. 365-367]. Концептуальна картина світу, на відміну від мовної, постійно змінюється, відображуючи результати пізнавальної і соціальної діяльності, однак фрагменти мовної картини світу протягом довгого часу зберігають реліктові уявлення людей про світостворення [1].

У нашому дослідженні концептуальна картина становить індивідуалізовані уявлення про світ, що є у нашій свідомості; мовна картина світу представлена словниковими дефініціями.

Для виявлення особливостей у будові мовної та концептуальної картин світу нами були залучені відомості про структуру лексичного та асоціативного значень слова економічної сфери вживання ВАЛЮТА на основі проведення вільного асоціативного експерименту зі студентами Державного економіко-технологічного університету транспорту (м. Київ), носіями російської та української мов. Всі реакції на відповідний стимул дали змогу встановити структуру концептуальної картини світу. Мовна картина світу формується засобами лексичного значення відповідного стимулу.

Зіставлення лексичного значення із асоціативним кожного із аналізованих стимулів відбувалося за алгоритмом, який представлений в роботах Л. Кушмар [9]: І. Фіксація лексичного значення стимулу КАПІТАЛ із словників та енциклопедій (– грошова одиниця, що використовується як засіб розрахунку в торгових операціях [4]; – це грошова одиниця, що використовується для вимірювання величини вартості товару [11]; це грошова одиниця, що використовується як світові гроші [6]; – це не новий тип грошей, а лише особливий спосіб їх функ-