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Cross-Linguistic Interactions in Bilingual Mental Lexicon and Professional Linguistic Competence Formation: an experimental research with native speakers of the Komi-Permyak and Russian languages

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Abstract

The paper presents an experimental research of cross-linguistic interactions in the mental lexicon of Komi-Permyak-Russian bilingual native speakers. Cross-linguistic interactions were considered in the dynamic aspect: as depending on the participants’ professional linguistic competence formation in relation to both languages (connected with getting higher education as school teachers of the Komi-Permyak and Russian languages). The research included a sociolinguistic survey, and a free associative test with the separate Komi-Permyak and Russian stimuli lists. The test was carried out at the initial and final stages of university studies. The experimental results demonstrate that simultaneous progress in both languages’ proficiency leads to significant changes in the bilinguals’ speech behaviour, as well as in the nature of cross-linguistic interactions in their mental lexicon. The dynamics revealed concerns the 3 main factors: 1) usage frequency of both languages by bilingual speakers; 2) general frequency and direction of cross-linguistic interactions in their mental lexicon; 3) the ratio of translational and non-translational shares of cross-linguistic interactions.

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1. Introduction

A steady interest to bilingualism was formed in linguistics/psycholinguistics in the middle of the XX century and has been constantly increasing ever since. This led to appearing a large number of theoretical and empirical studies aimed at solving the main problems connected with the phenomena of organization and functioning of two (or more) language systems in one brain. A significant place among these studies is occupied by bilingual mental lexicon research (see, e.g., Kirsner et al., 1984; Li & Farkas, 2002; Kroll & Tokowicz, 2005; Pavlenko, 2009).

In most general terms an individual mental lexicon is understood as a complex cognitive formation which fulfills the functions of arranging and storing information about objects and realia of the surrounding world, as well as about the linguistic units that denote them. Mental lexicon is formed in the course of the native language/languages acquisition, represents a complex self-organizing system, is dynamic in character and ensures all speech processes. Bilingual mental lexicon, as opposed to the monolingual one, integrates the units of two linguistic systems and, therefore, ensures the processes of speech perception and production in two languages. Most authors of current bilingual lexicon research interpret it as an extended unified system which units do not just co-exist in the common mental space, but ceaselessly interact and influence each other.

On the one hand, such notion of bilingual mental lexicon is based on the results of numerous neurophysiologic research that use the ERP (event related potential) and fMRI (functional magnetic resonance imaging) methodology, and explore localization and degree of activation of various brain areas that are responsible for bilingual language processing (Thierry & Wu, 2007; Martin et al., 2009; Meuter, 2009; Moreno & Kutas, 2009; van Heuven & Dijkstra, 2010).

The experimental data received from salutary subjects as well as from those suffering from aphasia, demonstrate the following: 1) both languages are processed in the same brain areas; 2) neural brain structures that correspond to linguistic knowledge of an individual are represented in form of a unified integrated neural network which elements are characterized by multiple interactions and mutual overlapping; 3) these neural structures’ activation is non-selective, i.e. speech activity in one language (the target language of communication) implies that the second (non-target) language is also activated automatically and simultaneously, and exerts a certain influence (stimulating or inhibiting) on the speed and accuracy of speech activity in the target language.

On the other hand, co-existence of the two languages within a unified system characterized by non-selective activation and multiple cross-linguistic interactions is proved by results of numerous psycholinguistic experimental studies based on investigating specific features of speech perception and production processes of a bilingual individual as compared to those of a monolingual one. Such data were obtained while studying bilingual language processing of individuals speaking different pairs of languages (Spanish and Catalan, English and Russian, Dutch and English, English and Chinese etc.), characterized by different levels of the L1 and L2 proficiency (comparably high proficiency in both languages vs. incomparable proficiency in the L1 and L2), having acquired the two languages in different settings (native speakers of the two languages vs. classroom L2 learners), characterized by different AoA (age of acquisition) indices (bilinguals speaking both languages from childhood vs. those acquiring the L2 later in life) and so on (Brysbaert, 2003; Edmonds & Kiran, 2004; Marian, 2008; Lagrou, Hartsuiker, Duyck, 2011; Kennison, Fernandez, Bowers, 2014).

2. Objectives, methodology and research design

The paper presents an experimental research of cross-linguistic interactions in the Komi-Permyak-Russian bilingual mental lexicon. Cross-linguistic interactions are considered in dynamic aspect: along with professional linguistic competence formation in relation to both languages.

In pedagogy/linguodidactics professional competence is understood as a complex integrative formation which includes a certain set of knowledge, skills, abilities and personal qualities essential for effective realization of a particular professional activity (Kazantsev, 2011; Sharikov, 2012). The constituents of the native language teacher professional competence are psychological, pedagogical, linguistic, methodic (linguodidactic), and communicative competences. The most significant competence for our research goals is the linguistic one as the leading domain-specific competence connected with the increase in the native language proficiency and, therefore, able to influence directly cross-linguistic interactions in bilingual mental lexicon.
We hypothesized that simultaneous increase of proficiency in both native languages of a bilingual speaker widely used in everyday communication, as well as in the situation of professionally-oriented educational activity will lead to specific changes in the nature of cross-linguistic interactions in bilingual mental lexicon.

The experimental research was carried out with 45 students of the Komi-Permyak-Russian department of the philological faculty at the Perm state humanitarian-pedagogical university. The informants are getting higher education as school teachers of the Komi-Permyak language and literature, and of the Russian language. For the purposes of studying the dynamics of cross-linguistic interactions in bilingual mental lexicon corresponding to different stages of professional linguistic competence formation all the informants were divided into two groups: students of the first and second years of studies (the initial stage of professional linguistic competence formation) and students of the fourth and fifth years of studies (the final stage of professional linguistic competence formation). Let us now consider our informants in detail.

The Komi-Permyaks belong to the Finno-Ugrian ethnic group, reside in the north-west of the Perm region and are estimated in number of over 80 000 people (according to the data of all-Russian population census in 2010). As representatives of a separate ethnus with its own language and culture, the Komi-Permyaks pertain to a group of native bilinguals: from early childhood they simultaneously acquire two languages – Komi-Permyak and Russian – in natural settings. According to the data of sociolinguistic surveys, Komi-Permyak teenagers and young adults can fluently speak both languages and actively use them in their everyday life (Dotsenko, Leschenko, Ostapenko, 2013). Both the Komi-Permyak and the Russian languages are widely spread as a means of “home”, intrafamilial communication, as well as that of school communication. On the territory of the Komi-Permyak district primary school education is realized by means of both languages; in secondary/high school the majority of subjects are taught in Russian, while Komi-Permyak is studied as a special subject (Otchet, 2013). Students of the Komi-Permyak-Russian department of the philological faculty at the Perm state humanitarian-pedagogical university are Komi-Permyaks by nationality; they come from the Komi-Permyak district and speak both the Komi-Permyak and Russian languages equally well.

As it is mentioned in pedagogic research, professional linguistic competence of philology students is based on forming their linguistic conscience and represents a complex of linguistic knowledge and abilities to use it in professional pedagogical and scientific activity (Akhmadullina, 2007; Sokolnitskaya, 2012). The complex of professional knowledge of our informants implies acquiring basic phonological and lexical norms of the Komi-Permyak and Russian literary languages, learning fundamental grammar categories and their forms, working out the ability to construct syntactic structures in accordance with the standard language norms, developing the skill to use all the variety of language synonymic tools effectively, as well as forming the ability to analyze and evaluate linguistic facts and phenomena in both languages.

In accordance with the curriculum of the Komi-Permyak department all subjects connected with the Komi-Permyak language, literature, folklore etc. are taught in Komi-Permyak (Native Language, History of the Native Language, History of the Native Literature, Native Dialectology etc.), while all the other subjects - those that refer directly to the Russian language and literature (Russian Language, History of Russian Literature, Russian Folklore etc.), as well as to all general subjects (History, Philosophy, Psychology, Pedagogy, Information Technologies etc.) are taught in Russian. Thus, on the one hand, university education settings in general are characterized by significant preponderance of the Russian language occurrence frequency as compared to Komi-Permyak occurrence frequency. On the other hand, in the situation of professional linguistic competence formation both languages are used with approximately equal frequency.

2.1. Experimental research: Step 1

For the purpose of specifying the status of the Komi-Permyak and Russian languages of our informants, as well as for defining their usage frequency in everyday communication, a preliminary written survey was carried out at the first stage of the research. In the survey the informants were asked questions about the age of both their languages’ acquisition, the native language/languages of their parents, their Komi-Permyak and Russian proficiency levels, the frequency and situations of both languages’ usage etc.
The survey results proved that all the participants acquired the two languages in early childhood and speak them fluently, which enables us to define them both as the native languages. The proportion of both languages’ usage frequency at different stages of professional linguistic competence formation is shown in Table 1.

Table 1. Percentage ratio of the Komi-Permyak and Russian languages’ usage frequency at the initial and final stages of linguistic competence formation

<table>
<thead>
<tr>
<th></th>
<th>1 - 2 years of study</th>
<th>4 - 5 years of study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Komi-Permyak</td>
<td>33%</td>
<td>43%</td>
</tr>
<tr>
<td>Russian</td>
<td>46%</td>
<td>22%</td>
</tr>
<tr>
<td>Both languages</td>
<td>21%</td>
<td>35%</td>
</tr>
</tbody>
</table>

According to the data of Table 1, in the course of professional linguistic competence formation general frequency of using the Komi-Permyak and the Russian languages by our informants undergo certain changes.

At the initial stage of their professional linguistic competence formation almost a half of the informants (46%) point at the Russian language as the one mainly used in communication. We assume, that such tendency is explained by the fact that after moving to the city of Perm and entering the Perm University our informants get into the Russian-speaking environment. Therefore, except for the situation of university education, they have to use Russian actively in common everyday situations: in shops, public transport, cafes, hostels etc. The Komi-Permyak language is pointed at as the most frequently used one by about a third of the informants (33%). The main spheres of its usage are the sphere of intrafamilial communication, communication with friends and university group mates, as well as the lessons of the Komi-Permyak language and literature. Moreover, despite the fact that in the survey the question asked unambiguously implied choosing only one most frequently used language (“Which language do you use most frequently?”) about one fifth of the informants (21%) could not restrict their choice by one language only and pointed at both Komi-Permyak and Russian as used with equal frequency. This demonstrates that already at the initial stage of professional linguistic competence formation both languages actively compete in bilingual mental lexicon and appear to exist in close contact.

At the final stage of professional linguistic competence formation the total period of the informants’ living in the Russian-speaking environment increases more than twofold; consequently, the cumulative experience of the Russian language usage (both in education settings and in everyday communication) begins to dominate significantly over the Komi-Permyak language usage. Nevertheless, at this stage Russian usage frequency decreases sharply (more than two times, down to 26%); along with it the increase of Komi-Permyak usage frequency (up to 43%), as well as that of both languages’ usage frequency (up to 35%) is observed.

We assume, that such dynamics can be explained by the two main factors. On the one hand, professional linguistic competence formation as related to the Komi-Permyak language implies elaboration of the ethnic self-consciousness which is manifested in raising the national language status and amending the emotional and evaluative attitude to it. Consequently, Komi-Permyak native speakers tend to use their native language more actively and with greater relish. On the other hand, simultaneous study of the two languages as university subjects stipulates constant juxtaposition of both linguistic systems, profound analysis and active comparison of various facts and phenomena characteristic for them and, therefore, intensifies the habit of their concurrent use and constant overlap.

2.2. Experimental research: Step 2

To study cross-linguistic interactions in the Komi-Permyak-Russian bilingual mental lexicon at the second stage of the research a free written associative test with two stimuli lists (54 high-frequent words in the Komi-Permyak and Russian languages) was carried out with a two weeks’ interval. The participants were asked to react to each word from the list with the first word occurring; the language code of verbal reactions was not restricted. About 6000 verbal reactions and 57 reactions-refusals were received.
The unit of experimental material analysis is an associative-verbal pair: a word-stimulus and its verbal reaction. All associative-verbal pairs were divided into two main groups: intralingual pairs (a word-stimulus and a word-reaction are in one language) and interlingual pairs (a word-stimulus and a word-reaction are in different languages).

We assumed that occurrence of interlingual associative-verbal pairs testifies activation of cross-linguistic interaction mechanism in the mental lexicon of the informants; in this context each interlingual “stimulus-reaction” pair represents certain specific features (variety and direction) of cross-linguistic interactions. All the interlingual associative-verbal pairs received at the two stages of professional linguistic competence formation were analyzed with regard to their quantitative and qualitative characteristics and further compared. This enabled us to reveal the general dynamics of cross-linguistic interactions in our informants’ mental lexicon.

3. Discussion of the research outcomes

Let us consider specific features of cross-linguistic interactions of the Komi-Permyak and Russian languages in reference with their frequency and type.

3.1. Frequency of cross-linguistic interactions in the mental lexicon of the Komi-Permyak-Russian bilingual students at different stages of their professional linguistic competence formation

The general frequency of interlingual and intralingual associative reactions received in the experiment is presented in Table 2.

Table 2. Percentage ratio of interlingual and intralingual associative reactions for the Komi-Permyak and Russian stimuli at the initial and final stages of linguistic competence formation

<table>
<thead>
<tr>
<th></th>
<th>1-2 years of the study</th>
<th>4-5 years of the study</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Intra-lingual</td>
<td>Inter-lingual</td>
</tr>
<tr>
<td>Komi-Perm. stimuli</td>
<td>52%</td>
<td>48%</td>
</tr>
<tr>
<td>Russian stimuli</td>
<td>95%</td>
<td>5%</td>
</tr>
</tbody>
</table>

At the initial stage of professional linguistic competence formation the participants prefer to produce intralingual associative reactions for both Komi-Permyak and Russian stimuli. The quantity of intralingual associative-verbal pairs is especially numerous for Russian stimuli (95%): семья “family” → дружная “friendly”; приходить “come” → вовремя “in time”, while the Komi-Permyak stimuli evoke intralingual reactions a little more than in one-half of all the cases (52%): добр “good” → уваж “work”; асыв “morning” → къёкэ “cold”; босыми “take” → сёян “food”.

Such predominance of intralingual reactions for the Russian stimuli demonstrates that while speaking Russian Komi-Permyak-Russian bilinguals prefer to remain within the frames of this language only, i.e. the Russian language system in their mental lexicon is characterized by a relatively isolated position, possesses non-penetrable boundaries and, therefore, does not tend to interact with the Komi-Permyak language. On the contrary, the Komi-Permyak language seems to have boundaries characterized by high penetrable ability: the Komi-Permyak words are freely included into the Russian associative contexts and, in this way, are interacting extensively with Russian words. This tendency correlates with the survey data which demonstrate that Russian is more frequently used by the Komi-Permyak-Russian bilingual students in their everyday communication. Obviously, the more functional language (Russian) dominates over the less functional one (Komi-Permyak) which is manifested in unidirectional character of cross-linguistic interactions in bilingual mental lexicon: they are realized in the direction from the Komi-Permyak language to the Russian language only, but do not proceed in the backwards direction. At the final stage of professional linguistic competence formation we observe a significant increase in cross-linguistic interactions frequency as related to the Russian language: the quantity of interlingual reactions produced for the
Russian stimuli increases more than 3 times (from 5% to 18% respectively). This data proves that the mechanism of cross-linguistic interactions in relation to the dominant language (Russian) begins to shape and further develop in our informants’ mental lexicon, so that they acquire bi-directional character with the Russian language taking an active part.

3.2. Types of cross-linguistic interactions in the mental lexicon of the Komi-Permyak-Russian bilingual students at different stages of their professional linguistic competence formation

The cross-linguistic interactions singled out of the total array of the experimental material are represented by the two types: interactions of translational and non-translational type.

Translational cross-linguistic interactions are based on actualization of translational associative links between pairs of words - cross-linguistic semantic equivalents, though the degree of equivalence in the “stimulus – reaction” pair can vary. The whole set of cross-linguistic translational associative-verbal pairs includes the following varieties: 1) equivalent translational associations: уде “work” -> работа; вил “new” -> новый; тёер “know” -> знать; 2) rough translational associations: (чаётун “suppose” -> знать “know”; ктвчукёр “dictionary” -> книга “book”; ныкло вдос “famous” -> знакомый “familiar”); 3) error translational associations (чаётун “suppose” -> чай “tea”; ктвчукёр “dictionary” -> стихотворение “poem”).

We suppose that regardless of “correctness” degree of translational reaction (the degree of stimulus word correspondence to its cross-linguistic equivalent given in bilingual dictionary), actualization of cross-linguistic translational links proves convergence of the two linguistic systems in bilingual consciousness which is based on mapping the two word forms from different languages onto the common meaning. Such mapping is realized by way of actualizing semantic proper word links and forms the basis for cross-linguistic translation: a full switch from one linguistic system to another realized for the purposes of successive meaning conveyance. It appears that both linguistic systems herein are realized by a bilingual individual as relatively independent from each other; they both seem to be represented collaterally within the common mental space and are each of them characterized by particular specific features of their units.

Non-translational cross-linguistic interactions are based on establishing non-translational syntagmatic, paradigmatic, or thematic associative links between the words of the two languages.

Syntagmatic non-translational links appear as a result of the speech combinatorial mechanism work and are based on linear expansion of the stimulus: нык “woman” -> работает “works”; нппр “example” -> вайётун “give”; нык “good” -> семья “family”; вил “new” -> платы “dress”; знаненит “famous” -> мор “man”.

Paradigmatic non-translational links are based on the speech selection mechanism work, reflect systematic properties of words of different languages and are produced on the basis of semantic similarity/opposition relationship between them: мёжк “large” -> маленький “small”; сетованы “give” -> брать “take”, пондло тун “begin” -> заканять “finish”; босстью “take” -> дать “give”.

Thematic non-translational links are deeper extra linguistic conceptual associations which refer the individual to the whole array of notions, images, feelings and emotions connected with a word. Such links represent the stimulus’ relationship not so much with other verbal units, as with communicative situation itself, its space and time coordinates. Unlike paradigmatic (linguistic proper) links which reflect automatic operations of logical thinking (categorization, unification, opposition), thematic (extra linguistic) links represent frequent situational, objective, subjective and suchlike “illogical” links: асви “morning” -> будильник “alarm clock”; велотив “teacher” -> знание “knowledge”; нерны “do” -> руки “hands”.

In general, cross-linguistic non-translational links corroborate convergence of two linguistic systems in bilingual mental lexicon by means of matching their syntactic, systematic/categorical, and situational/cognitive properties. Such convergence serves as the basis for the code-switching mechanism formation understood as fluent frequent transfers between the two languages. These transfers are realized within the frames of the common communicative situation and imply conveying the meaning of the utterance by ways of the two languages alternately. We assume, that actualization of cross-linguistic non-translational associative links is indicative of a certain blending of the two linguistic systems in bilingual mental lexicon. This blending results in large-scale comparison of words belonging to different languages, as well as extensive overlap and transfer of their semantic, syntactic and other linguistic
properties. Therefore, it can be supposed that professional linguistic competence formation leads to emergence in bilingual mental lexicon of a mixed-language (blended) subsystem in which the two languages do not just co-exist collaterally, but intermingle to a great extent and, thus, are able to interchange freely in any language context.

Table 3 represents the percentage of cross-linguistic translational and non-translational interactions received at different stages of professional linguistic competence formation.

Table 3. Percentage ratio of cross-linguistic translational and non-translational interactions for the Komi-Permyak and Russian stimuli at the initial and final stages of professional linguistic competence formation

<table>
<thead>
<tr>
<th></th>
<th>1-2 years of study</th>
<th>4-5 years of study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Komi-Perm. stimuli</td>
<td>57%</td>
<td>43%</td>
</tr>
<tr>
<td>Russian stimuli</td>
<td>90%</td>
<td>10%</td>
</tr>
</tbody>
</table>

The data presented in Table 3 demonstrate that at both stages of professional linguistic competence formation of the Komi-Permyak-Russian bilinguals the quantity of translational interactions steadily dominates over that of non-translational ones: the share of the former represents more than one-half among the total number of cross-linguistic interactions at each stage considered and for both languages.

At the initial stage of professional linguistic competence formation translational cross-linguistic interactions are more peculiar for the Russian stimuli (90%) in comparison with the Komi-Permyak stimuli (57%). Apparently, this proves that originally the Russian language is characterized by a greater degree of isolation in our informants’ mental lexicon as compared to the Komi-Permyak language. Komi-Permyak words are more actively embedded into the Russian associative environment which confirms that blending of the two languages occurs mostly in one direction: from the Komi-Permyak language to the Russian one. At the final stage of professional linguistic competence formation the quantity of translational cross-linguistic interactions is slightly increasing for the Komi-Permyak stimuli (63%) and at the same time is significantly decreasing for the Russian stimuli (78%).

Such dynamics correlates with the usage frequency of the Russian and Komi-Permyak languages revealed by the above-described survey. According to the survey data, professional linguistic competence formation is followed by significant decrease of the Russian language usage frequency followed by increase of the Komi-Permyak language frequency, as well as that of alternative usage of both languages (see Table 1). Apparently due to these changes, the Russian language forfeits its isolated position in bilingual mental lexicon and, at the same time, opens its boundaries for active interactions with the Komi-Permyak language. Besides establishing one-to-one semantic correspondences (equivalent translations) to the Komi-Permyak words, Russian words start being embedded into the general Komi-Permyak associative context. As a result, the penetrating ability of the boundaries of the two language systems becomes mutual which leads to bidirectional blending of the languages in the mental lexicon: in the direction from the Komi-Permyak language to the Russian one and back, from the Russian language to the Komi-Permyak one.

At the same time it should be noted that at the final stage of professional linguistic competence formation general alignment of the total ratio of translational and non-translational cross-linguistic reactions produced for the Komi-Permyak and Russian stimuli (63% and 78% of translational reactions and 37% and 22% of non-translational reactions respectively) is observed. This obviously shows that both languages in bilingual mental lexicon start mutually influencing each other, so that the degree of their relative isolation on the one hand, and the degree of penetrability of their boundaries on the other hand gradually similize.

4. Conclusion

An experimental research with Komi-Permyak-Russian bilingual university students - fluent native speakers of both languages, carried out at different stages of their professional linguistic competence formation was aimed at revealing the dynamics of cross-linguistic interactions in their mental lexicon.
The results of the research show that simultaneous progress in both languages’ proficiency connected with getting higher education at the Komi-Permyak-Russian department of the philological faculty leads to significant changes in the informants’ speech behaviour, as well as in the nature of cross-linguistic interactions in their mental lexicon. The dynamics revealed concerns the 3 main factors: 1) usage frequency of both languages by bilingual speakers; 2) general frequency and direction of cross-linguistic interactions in their mental lexicon; 3) the ratio of translational and non-translational shares of cross-linguistic interactions.

Alteration in usage frequency of the Komi-Permyak and Russian languages is manifested in the fact that senior bilingual Komi-Permyak-Russian students more often resort to using both languages in communication. This obviously happens due to active elaboration of the informants’ national self-identity which results in uplifting of their national language status: it begins to function as a fully-fledged communicative means on equal terms with the Russian language. On the other hand, such tendency is also stipulated by professionally oriented bilingual educational context: both linguistic systems are subject to extensive juxtaposition, mapping and comparison which leads to strengthening of their ability to interchange in various communicative contexts.

Changes in general frequency and direction of cross-linguistic interactions in bilingual Komi-Permyak-Russian mental lexicon are revealed in augmenting the total quantity of interlingual reactions produced by the participants of the experiment, as well as in active formation of bi-directional associative routes between words of the two languages (from Komi-Permyak to Russian and backwards, from Russian to Komi-Permyak).

As for the ratio of translational and non-translational shares of cross-linguistic interactions between the two languages, the difference in their general proportion in respect to the Komi-Permyak and the Russian languages that proved to be quite significant at the initial stage (1 - 2 years of study) aligns considerably by the final stage (4 - 5 years of study). This proves that along with professional linguistic competence formation the two languages in bilingual mental lexicon start mutually influencing each other, so that they gradually develop a higher level of resemblance. This is manifested in comparative equation of the degree of their relative isolation in the lexicon, as well as of the degree of penetrability of their boundaries.

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