

REVIEW
of the official reviewer for dissertation work
Karlygash Zhaksylykkyzy on the theme «Neurolinguistics of trilingualism: markers of lexico-semantic processing in cross-language interaction» presented for the degree of Doctor of Philosophy (PhD) in the specialty «8D02303 – Linguistics».

№	Criteria	Eligibility (one of the options must be checked)	Justification of the position of the official reviewer
1.	The topic of the thesis (as of the date of its approval) corresponds to the directions of development of science and/or state programs	1.1 Compliance with priority areas of science development or government programs: 1) The thesis was completed within the framework of a project or target program financed from the state budget (indicate the name and number of the project or program) 2) The thesis was completed within the framework of another state program (indicate the name of the program) 3) The dissertation corresponds to the priority direction of the development of science, approved by the Higher Scientific and Technical Commission under the Government of the Republic of Kazakhstan (indicate the direction)	The dissertation topic corresponds to the priority areas of science: 1. The Concept for the Development of Language Policy in the Republic of Kazakhstan for 2023-2029 (Area 3. Improvement of language teaching methodology. Area 4. Development of the Kazakh language as a language of science). https://www.gov.kz/memleket/entities/kyzylorda-sayasat/press/article/details/206305?lang=ru 2. The Concept for the Development of Higher Education and Science in the Republic of Kazakhstan for 2023-2029 (Chapter 3. Development of Science). https://www.ku.edu.kz/files/admission/koncepciya_razvitiya_vo_nauki_23_29_rus.pdf 3. The dissertation was carried out within the framework of a targeted programme funded from the state budget: IRN BR 27198099 "Development of Integrative Scientific Research in Neuroscience". 4. The dissertation corresponds to the priority area of scientific development "Intellectual Potential of the Country", approved by the Higher Scientific and Technical Commission under the Government of the Republic of Kazakhstan (https://adilet.zan.kz/rus/docs/P2400000826).
2.	Importance for science	The work <u>makes</u> /does not make a significant contribution to science, and its importance is <u>well disclosed</u> /not disclosed	The work undoubtedly makes a substantial contribution to the development of modern linguistics, above all neurolinguistics, psycholinguistics, the theory of multilingualism and language acquisition, as well as cognitive neuroscience. The importance and scientific significance of the research are disclosed in the dissertation sufficiently fully and convincingly. 1. Methodological contribution. The dissertation proposes an integrative model for the study of bilingualism and trilingualism that is new for Kazakhstani science, combining methods of psycholinguistics, neurolinguistics and cognitive neuroscience. The author adapted and applied to Kazakh-Russian-English language material modern experimental techniques used in international practice, including the translation recognition paradigm, EEG recording, analysis of event-related potentials of the brain (ERP), and statistical modelling of mixed effects. Thus, a methodological foundation is created for the further development of experimental neurolinguistics in Kazakhstan.

			2. Empirical contribution. Of significant scientific value is the formation of a corpus of original experimental data on the mechanisms of lexico-semantic processing in Kazakh-Russian-English trilingualism. The obtained behavioural measures (accuracy and reaction time) and ERP data, in particular the results of the N400 component analysis, extend existing views on cross-language activation and the organisation of the trilingual lexicon. The resulting database can serve as an empirical basis for subsequent studies of cross-language interaction and multilingual processing in speakers of different language combinations. 3. Theoretical contribution. An important result of the dissertation is the refinement of ideas about the nature of multilingual lexical access. The data obtained indicate that, during third-language processing, both background languages may be activated simultaneously; however, the nature and efficiency of this activation depend on language biography and the configuration of language experience. Of particular interest is the author's proposed interpretative model of semantic access (forked route and roundabout route), which reflects different variants of cross-language interaction organisation in trilinguals and opens prospects for further empirical verification.
3.	The principle of independence	Self-reliance level: 1) <u>High</u>; 2) Medium; 3) Low; 4) No independence	Level of independence - high. The dissertation under review is an independent scientific study, as confirmed by the author's analysis of 228 scientific sources, the development of the research design, the collection and processing of factual material, the organisation and conduct of a neurolinguistic experiment involving informants who are speakers of different languages, as well as the validity of the conclusions and results obtained. The author of the dissertation independently mastered, adapted, tested and applied a set of modern psycholinguistic and neurophysiological research methods, including: the translation recognition paradigm, language experience survey using an adapted version of LEAP-Q, collection and analysis of behavioural data in terms of response accuracy and reaction time, EEG recording using a 64-channel ANT Neuro system, analysis of event-related potentials of the brain (ERP), identification and interpretation of the N400 component as a marker of lexico-semantic processing, preliminary processing of EEG data in BrainVision Analyzer, as well as statistical modelling of results in R/RStudio using mixed models. It should be especially noted that the author did not limit herself to using individual borrowed methods, but integrated them into a unified research

			system and adapted them to the study of Kazakh-Russian-English trilingualism. This demonstrates a high degree of research independence, mastery of modern tools of experimental neurolinguistics, and the ability to solve complex interdisciplinary scientific problems.
4.	The principle of inner unity	4.1 Justification of the relevance of the thesis: 1) <u>Justified</u> ; 2) Partially justified; 3) Not justified.	The relevance of the dissertation research is beyond doubt and is determined by several interrelated circumstances. First, the research topic corresponds to the priority areas of the state scientific and language policy of the Republic of Kazakhstan, aimed at strengthening the country's intellectual potential, modernising scientific infrastructure, developing interdisciplinary research and implementing modern research technologies. The Concept for the Development of Language Policy in the Republic of Kazakhstan for 2023-2029 emphasises the need to improve research methodology in linguistics, psychology and pedagogy. In this context, the dissertation forms a scientific and methodological basis for the development of experimental studies in Kazakhstan at the intersection of linguistics, psycholinguistics, neurolinguistics and cognitive neuroscience. Second, the relevance of the work is due to the insufficient study of neurocognitive mechanisms of multilingual processing in the Kazakhstani scientific space. Despite the active development of research on bilingualism and trilingualism in global science, the Kazakh-Russian-English language combination has practically not been the object of experimental neurolinguistic research using modern methods of recording and analysing event-related potentials of the brain (ERP). Third, the practical significance of the research is determined by the features of the current language situation in Kazakhstan, characterised by the coexistence and functional interaction of Kazakh, Russian and English. A generation of young people has formed in the country who speak three languages and use them in various communicative and educational domains. In this regard, the study of the mechanisms of lexico-semantic processing under trilingualism acquires not only theoretical but also social significance, creating prerequisites for the scientifically grounded improvement of language education and the further development of multilingualism research.
		4.2 The content of the thesis reflects the topic of the thesis: 1) <u>Reflects</u> ; 2) Partially reflects; 3) Does not reflect	The content of the dissertation fully reflects and reveals the stated research topic. The structure of the dissertation is characterised by internal logic and consistency of presentation, while the content of all sections and subsections

			is aimed at solving the stated research tasks and achieving the research goal. The first section is devoted to the analysis of domestic and foreign scientific sources, the formation of the conceptual and terminological apparatus of the study, and the consideration of psycholinguistic, neurolinguistic and neurocognitive approaches to the study of multilingualism. The dissertation candidate's attention to the problem of the metalanguage of neurolinguistics and psycholinguistics deserves a positive assessment. In the context of the formation and development of the Kazakh language as a language of modern science, the systematisation and clarification of scientific terminology in new interdisciplinary fields of knowledge acquire special significance. In this respect, the dissertation contributes to the understanding and adaptation of the conceptual apparatus of experimental neurolinguistics to the Kazakhstani scientific context. The second section presents and substantiates in detail the research design, describes the methodology of the experiment and characterises the participants. The author convincingly justifies the choice of two mirror groups of trilinguals, describes their language profiles, selection procedures and ethical support of the study, and consistently reveals all stages of the experimental work. The third section contains the results of an original neurolinguistic experiment using modern methods of data recording and interpretation, including EEG, analysis of event-related potentials of the brain (ERP), investigation of the N400 component and modelling of behavioural indicators. The presented results directly correspond to the research questions and allow the author to arrive at substantiated conclusions regarding the features of lexico-semantic processing under Kazakh-Russian-English trilingualism. Thus, the content of the dissertation fully corresponds to its topic, and all sections and subsections are logically interconnected, consistently reveal the research design and ensure the internal unity of the work.
		4.3. The purpose and objectives correspond to the topic of the thesis: 1) <u>correspond</u>; 2) partially correspond; 3) do not correspond	The aim and objectives of the dissertation research fully correspond to the stated topic of the work and the logic of its structure. The stated aim is specified through five interrelated research objectives covering all stages of scientific inquiry: from the analysis of theoretical approaches and the formation of the conceptual and terminological basis of the study to the development of the experimental design, the conduct of the neurolinguistic experiment, the analysis of behavioural and ERP data, and

			the interpretation of the results obtained. It should be noted that each of the stated objectives has been consistently addressed in the relevant sections of the dissertation. The achievement of the research aim is confirmed by the empirical data obtained and the conclusions formulated, which indicates the integrity of the scientific design and the internal coherence of the work. It should be especially emphasised that the research objectives are formulated operationally and allow experimental verification, which corresponds to modern requirements for dissertation research in experimental linguistics and cognitive neuroscience.
		4.4 All sections and provisions of the thesis are logically interconnected: <u>1) completely interconnected;</u> 2) the interconnection is partial; 3) there is no interconnection	All sections and provisions of the dissertation are fully interconnected. The dissertation includes an Introduction, three sections, a Conclusion, a List of References and Appendices. The conclusions for each section reflect the stated objectives and the propositions submitted for defence.
		4.5 The new solutions (principles, methods) proposed by the author are reasoned and evaluated in comparison with the known solutions: <u>1) there is a critical analysis;</u> 2) partial analysis; 3) the analysis does not represent one's own opinions, but quotes from other authors	The new solutions (principles, methods) proposed by the author are substantiated and evaluated in comparison with known solutions: there is critical analysis. In the dissertation, the methodological solutions proposed by the author are argued and compared with existing approaches presented in domestic and foreign scientific literature. When considering the degree to which the problem has been studied, the dissertation candidate conducted a large-scale review of theoretical sources, analysed modern models of bilingual and multilingual lexical access, psycholinguistic and neurolinguistic approaches to the study of cross-language activation, and identified existing methodological and terminological discussions in psycholinguistics and neurolinguistics. Special attention should be paid to the critical analysis of existing experimental paradigms for studying multilingual processing. The author did not limit herself to reproducing known methods, but adapted them to the specifics of the Kazakhstani trilingual context and developed an original research design based on a combination of the translation recognition paradigm, behavioural indicators and the recording of event-related potentials of the brain. Using 105 English irregular verbs, 210 Kazakh and 210 Russian verbal stimuli, a comprehensive neurolinguistic study of the mechanisms of lexico-semantic processing under Kazakh-Russian-English trilingualism was

			conducted for the first time using EEG and analysis of the ERP N400 component. The obtained results made it possible to refine existing views on the nature of cross-language interaction and to show that, during third-language processing, the influence of background languages may differ and depend on the participants' language configuration. Thus, the critical analysis in the dissertation is not reduced to the presentation of other researchers' opinions; rather, it serves as the basis for developing the author's research position, choosing methodological solutions and interpreting the results obtained.
5.	Scientific novelty principle	5.1 Are the scientific results and provisions new? 1) <u>completely new</u>; 2) partially new (25-75% are new); 3) not new (less than 25% are new)	The scientific results and propositions are new: completely new. The scientific results and propositions presented in the dissertation possess scientific novelty and are completely new in the context of Kazakhstani research in experimental neurolinguistics and trilingualism. The work achieved five scientific results that received empirical confirmation in the course of the study. The novelty of the dissertation is manifested, above all, in the choice of the research object. For the first time, a comprehensive neurolinguistic study of the mechanisms of lexico-semantic processing was conducted on the material of Kazakh-Russian-English trilingualism using behavioural indicators and event-related potentials of the brain (ERP). The new data show that semantic mismatch effects are systematically modulated by candidate language, stimulus position and the configuration of the participants' first language. The results indicate the presence of cross-language semantic activation in trilinguals and show that features of language biography influence the nature of third-language word processing. Of particular scientific value is the conclusion that, when perceiving words in English (L3), both background languages - Kazakh and Russian - may be activated simultaneously; however, the nature of such activation is not identical. The data obtained allow one to assume the existence of different variants of semantic access organisation in the trilingual lexicon. In particular, speakers of Kazakh as a first language show a processing profile more compatible with parallel activation of semantic representations in two background languages, whereas speakers of Russian as a first language show less pronounced involvement of the second language in third-language processing. This result is consistent with data confirming non-selective access and parallel activation in bilingual processing in a broader sense (Grainger & Beauvillain, 1987; Beauvillain, 1992; Grainger and Dijkstra,

			1992; Grainger, 1993; Li, 1996; Spivey and Marian, 1999; Marian and Spivey, 2003). The author's proposed interpretative model of semantic access, designated as the forked and roundabout routes, is of considerable scientific interest. This model is an original attempt to explain the identified differences in the organisation of the trilingual lexicon and undoubtedly represents the author's independent contribution to the development of multilingual processing research. At the same time, it appears that the proposed interpretation requires further empirical verification. In the present study, differences in the nature of cross-language activation are inferred primarily on the basis of behavioural indicators and the N400 profile of two groups of trilinguals. Additional confirmation of this model could be obtained by testing it on independent samples, by using quantitative indicators of language dominance and language proficiency, and by applying other experimental paradigms and neurophysiological markers. Such multi-level testing would make it possible to establish whether the identified differences reflect stable mechanisms of trilingual lexicon organisation or whether they are conditioned by the features of a specific sample of 38 participants who studied at one university and functioned in a particular sociolinguistic environment. Nevertheless, even in its present form, the proposed model allows for a new interpretation of differences in the organisation of the multilingual lexicon, demonstrates the prospects of integrating behavioural and neurophysiological data, and opens a new direction for further research on cross-language interaction in trilinguals. Another important result of the study is the acquisition of neurophysiological evidence that translation recognition in trilinguals includes the evaluation of semantic correspondence and is reflected not only in behavioural indicators but also in the dynamics of neural markers of semantic processing, above all the N400 component. Thus, the dissertation expands modern views on the temporal organisation of cross-language interaction and contributes to the understanding of the neurocognitive mechanisms of processing several languages.
		5.2 Are the dissertation findings new? 1) <u>completely new</u>; 2) partially new (25-75% are new); 3) not new (less than 25% are new)	The conclusions of the dissertation are new: completely new. The conclusions of the dissertation possess scientific novelty and logically follow from the stated aims, objectives and empirical data obtained. The conclusions of the first section are new in terms of systematising and

			conceptualising modern psycholinguistic and neurolinguistic approaches to the study of multilingualism. The author considers the problem of lexical access not as selective access to separate language systems, but as a process of graded activation and competition between languages. The view proposed in the dissertation on third-language processing, which is analysed not in isolation but in the context of an already formed bilingual system, appears important. The author's work on adapting and introducing the terminological apparatus of neurolinguistics and psycholinguistics into scholarly use in relation to the Kazakh language also deserves positive evaluation, as it contributes to the development of Kazakh as a language of modern science. The conclusions of the second section are also new, since the author developed and implemented an original psycholinguistic and neurolinguistic methodology for studying Kazakh-Russian-English trilingualism. Of scientific interest is the choice of stimulus material - English irregular verbs in comparison with the verbal systems of Kazakh and Russian. The use of this material made it possible to study the mechanisms of semantic mismatch during translation recognition and to trace the features of trilinguals' neurocognitive response to this mismatch through the analysis of the N400 component. The conclusions of the third section appear to be the most significant and original. The author shows that trilingual word recognition is not a sequential appeal to isolated language systems, but an interactive lexico-semantic process dependent on the participants' language experience. The results indicate that the configuration of the first and second languages influences the nature of cross-language activation and the degree of sensitivity to semantic mismatch. Of special importance is the conclusion about the possible existence of different routes of semantic access in the trilingual lexicon. The author proposes to distinguish two variants of cross-language processing organisation. The first variant - the forked route - is characterised by relatively parallel activation of both previously acquired languages, when an English word provides direct access to a shared lexico-semantic representation through two language systems simultaneously. This profile proved more characteristic of the Kazakh L1 - Russian L2 - English L3 group. The second variant - the roundabout route - presupposes less independent involvement of the second language, whereby access to its semantic
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			representations may be mediated through the more stably activated first language. The author associates this profile with the Russian L1 - Kazakh L2 - English L3 group, in which the processing of Kazakh equivalents was accompanied by a less pronounced differentiation between congruent and incongruent stimuli. At the same time, it should be noted that the proposed forked route and roundabout route models should be considered primarily as an original interpretation of the data obtained and as a promising research hypothesis. At present, the question remains open as to whether the identified differences reflect stable types of trilingual lexicon organisation or are a feature of this sample of 38 participants who studied at one university and functioned in a specific sociolinguistic environment. Additional testing of the proposed model on independent samples using quantitative indicators of language dominance and other experimental paradigms would make it possible to clarify the universality of the identified patterns. An important outcome of the dissertation is the neurophysiological evidence that translation recognition in trilinguals includes the evaluation of semantic correspondence and manifests itself not only in behavioural indicators but also in the dynamics of neural markers of semantic processing, above all the N400 component. Thus, the dissertation contributes to the understanding of mechanisms of cross-language interaction and expands modern views on the neurocognitive mechanisms of processing several languages.
		5.3 Technical, technological, economic or management decisions are new and reasonable: 1) <u>completely new</u>; 2) partially new (25-75% are new); 3) not new (less than 25% are new)	Technical, technological, economic or managerial solutions are new and substantiated: completely new. Although the dissertation research was carried out in the field of "Linguistics", the work presents scientific-methodological and experimental-technological solutions that are new for Kazakhstani science and are related to the organisation and conduct of a neurolinguistic experiment. The novelty of these solutions lies in the integration of modern technologies of cognitive neuroscience and psycholinguistics into the study of Kazakh-Russian-English trilingualism. The author developed and implemented an original experimental design that includes the selection and adaptation of stimulus material, application of the translation recognition paradigm, registration of behavioural indicators (response accuracy and reaction time), as well as the use of electroencephalography (EEG) and analysis of event-related potentials of the brain (ERP). The technological validity of the study is confirmed by the use of a modern

			64-channel ANT Neuro EEG recording system and a standardised procedure for processing neurophysiological data. Preliminary processing of EEG signals was carried out in the specialised BrainVision Analyzer environment and included data filtering, correction of eye-movement artefacts using independent component analysis (ICA), visual quality control of recordings, signal segmentation relative to the moment of stimulus presentation, baseline correction, and extraction of an a priori time window for analysing the N400 component. Of particular value is the application of these technological solutions to material from Kazakh, Russian and English. For the first time in domestic neurolinguistic practice, the N400 component was used to study the mechanisms of lexico-semantic processing and translation recognition under Kazakh-Russian-English trilingualism. This made it possible to obtain objective neurophysiological data on the temporal organisation of cross-language processing and to expand the research tools of experimental linguistics in Kazakhstan. Thus, the technical and experimental-technological solutions proposed in the dissertation are scientifically substantiated, methodologically verified and undoubtedly novel for domestic research in neurolinguistics and multilingualism.
6.	The validity of the main findings	All main conclusions are/are not based on scientifically significant evidence or well-grounded (for qualitative research and areas of training in the arts and humanities)	Validity of the main conclusions. All main conclusions of the dissertation are <u>based</u> on evidence that is significant from a scientific point of view and are sufficiently well substantiated. First, the validity of the conclusions is ensured by the sufficiency and careful design of the experimental material, which includes stimuli in three languages and was specially developed to test the proposed hypotheses. The use of English irregular verbs and their translation equivalents in Kazakh and Russian made it possible to create controlled conditions for studying mechanisms of cross-language activation and semantic mismatch under trilingualism. Second, the reliability of the conclusions is determined by the multidimensional nature of the study. The author consistently analyses modern theoretical models of multilingual lexical access, psycholinguistic and neurolinguistic mechanisms of cross-language activation, and compares behavioural indicators of experimental-task performance with neurophysiological markers of lexico-semantic processing. The study

			involved 38 respondents who are sequential trilinguals with Kazakh-Russian-English and Russian-Kazakh-English language repertoires. It should be noted that, for studies using ERP methodology, such a sample size corresponds to established international research practice and allows statistically interpretable results to be obtained. Third, the validity of the conclusions is confirmed by the use of a set of mutually complementary experimental and statistical methods. The author applied the translation recognition paradigm, electroencephalographic (EEG) data recording, analysis of event-related potentials of the brain (ERP), in particular the N400 component, as well as statistical modelling of behavioural and neurophysiological data using mixed models. The consistency of results obtained using different methods increases the reliability of the conclusions and reduces the probability that they are incidental. At the same time, it should be noted that certain interpretations of the results, primarily those related to the assumption of different routes of semantic access (<i>forked route and roundabout route</i>), require further empirical testing on independent samples and using additional indicators of language experience and language dominance. However, this circumstance does not cast doubt on the reliability of the main results of the study, but rather identifies promising directions for further development of the model proposed by the author. Thus, the main conclusions of the dissertation are scientifically substantiated, confirmed by a combination of behavioural, neurophysiological and statistical data, and appear convincing.
7.	The main provisions for the defense	It is necessary to answer the following questions for each provision separately: 7.1 Is the provision proven? 1) proven; 2) rather proven; 3) rather not proven; 4) not proven 7.2 Is it trivial? 1) yes; 2) no 7.3 Is it new? 1) yes; 2) no 7.4 Application level:	Five propositions are submitted for defence in the dissertation under review. Proposition 1. 1. proven. The dissertation candidate convincingly shows that the development of neurolinguistics in Kazakhstan requires both methodological reflection and the formation of its own conceptual and terminological apparatus. The analysis of domestic and foreign sources, as well as the author's systematisation of the metalanguage of psycholinguistics and neurolinguistics, confirms the validity of this proposition. 2. no 3. yes 4. broad 5. yes

		1) narrow; 2) medium; 3) wide 7.5 Is it proven in the article? 1) yes; 2) no	The proposition is reflected in the following publications: • Zhaksylykkyzy, K., Ibrayeva, Z. K., Kustubayeva, A. M., Roehm, D., & Zholdassova, M. (2026). Processing effects of L1/L2 from L3 in translation recognition paradigm: An exploratory ERP study. <i>Frontiers in Psychology</i>, 16, Article 1710959. https://doi.org/10.3389/fpsyg.2025.1710959 • Zhaksylykkyzy, K., & Zholdassova, M. K. (2020). Til men mi neirolingvistika aspektisinde [Language and the brain in the aspect of neurolinguistics]. <i>Science and Life of Kazakhstan</i>, 4/1, 301-307. • Ibrayeva, Zh. K., Nabiyeve, G. S., Zhaksylykkyzy, K., & Kustubayeva, A. M. (2023). Psycholinguistics and Neurolinguistics Russian-English-Kazakh learner's dictionary of terms. Qazaq Universiteti. Proposition 2. 1. proven. The influence of Kazakhstan's current language situation and language policy on the formation of a special group of young sequential trilinguals is confirmed both by the analysis of scientific literature and by the results of the experimental study conducted. The data obtained indicate the existence of a specific language experience of Kazakhstani trilinguals, which must be taken into account when studying mechanisms of multilingual processing. 2. no 3. yes 4. broad 5. yes. The proposition is reflected in the following publications: • Ibrayeva, Zh. K., & Zhaksylykkyzy, K. (2021). The role of neurolinguistic research in the study of bilingualism. <i>Bulletin of Abai KazNPU. Series of Philological Sciences</i>, 75(1), 67-73. https://doi.org/10.51889/2021-1.1728-7804.11 • Zhaksylykkyzy, K. (2020). Methods of neurolinguistics. In VI International Farabi Readings "Farabi Alemi" (p. 165). Almaty, Kazakhstan. Proposition 3. 1. proven. The obtained results confirm that translation recognition in trilinguals is based not on a formal comparison of words, but on semantic verification. Systematic differences between congruent and incongruent stimuli in response accuracy and reaction time indicate that trilingual word
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			recognition relies on the evaluation of semantic correspondence. 2. no 3. yes 4. medium 5. yes. The proposition is reflected in the following publications: • Zhaksylykkyzy, K., & Nabiyeva, G. S. (2021). Sovremennyye metody psikholingvistiki i neirolingvistiki v usvoenii vtorogo yazyka [Modern methods of psycholinguistics and neurolinguistics in second language acquisition]. Eurasian Journal of Philology Science and Education, 183(3), 13-21. https://doi.org/10.26577/EJPh.2021.v183.i3.ph2 • Zhaksylykkyzy, K., Ibrayeva, Z. K., & Kustubayeva, A. M. (2021). Neurolinguistics and third language acquisition. In Current issues in modern linguistics and the humanities: Proceedings of the 13th All-Russian Research and Methodological Conference with International Participation (pp. 639-646). RUDN University. https://doi.org/10.22363/10784-2021-639-646 Proposition 4. 1. proven. The electrophysiological data obtained during the experiment indicate that semantic mismatch is detected already at the stage of lexico-semantic processing. The analysis of the N400 component showed that stimulus differentiation occurs before final decision-making and reflects processes of semantic evaluation, not only later stages of the behavioural response. 2. no 3. yes 4. broad 5. yes. The proposition is reflected in the following publications: • Ibrayeva, Zh. K., Zhaksylykkyzy, K., & Nabiyeva, G. S. (2023). Ushinshi tildi mengerudegi birinshi zhane ekinshi tildin yqpaly: Psikholingvistikalyq taldau [The influence of the first and second languages on third language acquisition: A psycholinguistic analysis]. TILTANYM, 92(4), 37-44. https://doi.org/10.55491/2411-6076-2023-4-37-44 • Ibrayeva, Z. K., & Zhaksylykkyzy, K. (2021). Neuropsychology of bilingualism and language acquisition. In Trends and prospects for the development of humanities education: Proceedings of the
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			international scientific-practical conference (pp. 39-43). Abai Kazakh National Pedagogical University. Proposition 5. 1. proven. The results of the study indicate that, when English is processed as a third language, the joint involvement of both background languages is possible; however, the nature and efficiency of such activation depend on the participants' language experience. The obtained data convincingly demonstrate differences between groups with different L1-L2 configurations. At the same time, it should be noted that the explanation of these differences through the forked route and roundabout route models represents the author's interpretation of the identified patterns, which, despite its scientific promise, requires further testing on independent samples. 2. no 3. yes 4. broad 5. yes. The proposition is reflected in the following publications: • Zhaksylykkyzy, K., Ibrayeva, Z. K., Kustubayeva, A. M., Roehm, D., & Zholdassova, M. (2026). Processing effects of L1/L2 from L3 in translation recognition paradigm: An exploratory ERP study. <i>Frontiers in Psychology</i>, 16, Article 1710959. https://doi.org/10.3389/fpsyg.2025.1710959 • Ibrayeva, Zh. K., Temirkhan, Zh., Kenzhebekkyzy, M., & Zhaksylykkyzy, K. (2025). Bilim berudi tsifrlandyru: XXI gasyrdagy shet tilin oqytu adisterinin transformatsiyasy [Digitalization of education: Transformation of foreign language teaching methods in the 21st century]. <i>Eurasian Journal of Philology Science and Education</i>, 198(2), 237-247. https://doi.org/10.26577/EJPh2025198222
8.	The principle of reliability Reliability of sources and information provided	8.1 Choice of methodology - is justified or the methodology is described in sufficient detail 1) yes; 2) no	The choice of methodology is substantiated, and the methodology is described in sufficient detail: yes. The choice of research methodology appears justified and fully corresponds to the aim, objectives and subject of the dissertation research. The author consistently argues for the need to use an interdisciplinary approach combining methods of psycholinguistics, neurolinguistics and cognitive neuroscience to study mechanisms of lexico-semantic processing under Kazakh-Russian-English trilingualism.

			The research methodology is described in detail and transparently. The dissertation presents all the main stages of the experimental work: justification of the choice of participants and the principle of forming two mirror groups of trilinguals, description of the procedure for assessing language experience, characteristics of the stimulus material, the sequence of stimulus presentation in the translation recognition paradigm, procedures for recording behavioural indicators and electroencephalographic data, methods of preliminary EEG signal processing and statistical analysis of the obtained results. The author's effort to ensure the reproducibility of the study should be positively assessed. The description of the experimental design, EEG recording parameters, data processing criteria and statistical models used is sufficient for understanding the logic of the study and for potential reproduction of the proposed protocol by other researchers. It should also be noted that the author observed ethical principles for research involving human participants. The dissertation describes in detail the procedures for obtaining participants' informed consent, the voluntary nature of participation in the study, and provides information on the approval of the study by the Local Ethics Committee of Al-Farabi Kazakh National University. This indicates that the study complies with modern requirements of academic integrity and research ethics. At the same time, it appears that in future studies the methodological apparatus could be strengthened by including objective quantitative indicators of language dominance and standardised tests of language competence, which would allow an even more precise interpretation of the identified differences between groups of trilinguals. However, this remark does not reduce the overall high assessment of the methodological validity of the dissertation.
		8.2 The results of the thesis were obtained using modern methods of scientific research and methods of processing and interpreting data using computer technologies: 1) yes; 2) no	The results of the dissertation were obtained using modern methods of scientific research and methods of data processing and interpretation with the application of computer technologies: yes. The principle of reliability is observed in the dissertation. The research results were obtained using modern methods of psycholinguistics, neurolinguistics and cognitive neuroscience that correspond to international research practice. The work applies a comprehensive methodology, including theoretical analysis of domestic and foreign scientific sources, a survey of participants'

		language experience using an adapted version of LEAP-Q, an experiment in the translation recognition paradigm, recording of behavioural indicators of accuracy and reaction time, and an electroencephalographic study followed by analysis of event-related potentials of the brain (ERP), including identification and interpretation of the N400 component. The study used modern computer programmes, technologies and specialised equipment: E-Prime 2.0 for presenting stimulus material and recording behavioural responses, a 64-channel ANT Neuro system for recording electroencephalographic data, the BrainVision Analyzer 2.0.1 software package for preliminary processing and analysis of neurophysiological data, and the R/RStudio environment for statistical modelling and processing of results using mixed models. It should be especially noted that the author did not limit herself to using individual modern technologies, but ensured their integration into a unified system of analysis. The comparison of behavioural indicators and neurophysiological data enabled a multi-level testing of the research hypotheses and increased the reliability of the conclusions obtained. Thus, the results of the dissertation were obtained using modern scientific research methods corresponding to international standards of experimental neurolinguistics, and the computer technologies and data processing methods applied ensure the reliability and reproducibility of the study.
	8.3 Theoretical conclusions, models, identified relationships and patterns have been proven and confirmed by experimental research (for areas of training in pedagogical sciences, the results have been proven on the basis of a pedagogical experiment): 1) yes; 2) no	Theoretical conclusions, models, identified relationships and patterns are proven and confirmed by experimental research: yes. The theoretical conclusions, identified relationships and patterns presented in the dissertation are generally proven and confirmed by the results of the experimental study conducted. The experimental work was carried out consistently in several stages. At the first stage, the selection and verification of stimulus material were conducted, criteria for including participants in the study were determined, their language experience was assessed using an adapted version of LEAP-Q, and a pilot experiment (n = 10) was conducted, which made it possible to clarify the parameters of the main study. At the second stage, the main neurolinguistic experiment was implemented using the translation recognition paradigm, electroencephalography (EEG) and analysis of event-related potentials (ERP). EEG recording was carried out using a 64-channel ANT Neuro system, and statistical data processing was performed in R/RStudio. The results were obtained from two mutually

			complementary sources: behavioural indicators (task accuracy and reaction time) and neurophysiological data, primarily the N400 component, which reflects features of lexico-semantic processing. At the third stage, the obtained results were interpreted and modelled, which made it possible to formulate conclusions regarding the roles of the first, second and third languages in cross-language activation processes and to explain differences caused by the participants' language experience. Of particular value is the fact that the theoretical propositions of the dissertation received experimental confirmation. The obtained data indicate that third-language processing is not reduced to sequential access to isolated language systems, but constitutes a dynamic lexico-semantic process that depends on language biography and the configuration of language experience. It has been experimentally confirmed that features of the first and second languages influence the nature of cross-language activation and sensitivity to semantic mismatch. A significant theoretical result of the study is the author's proposed interpretative model of the organisation of lexico-semantic access in trilinguals, presented as two functional routes - the forked route and the roundabout route. The basis for its development was the identified differences in behavioural indicators and N400 profiles of participants with different configurations of language experience. At the same time, it should be noted that what has been experimentally proven are the differences themselves in the nature of cross-language activation and the unequal involvement of background languages, whereas the proposed routes of access represent the author's theoretical interpretation of the identified patterns. This interpretation is scientifically grounded and promising; however, its universality requires further testing on independent samples and using additional indicators of language dominance and language experience. Thus, the main theoretical conclusions of the dissertation are confirmed by a combination of behavioural, neurophysiological and statistical data, and the identified patterns possess a sufficient degree of evidential support and contribute to the development of modern views on the neurocognitive mechanisms of trilingual processing.
		8.4 Important statements are confirmed / partially confirmed / not confirmed by references to current and reliable scientific literature	Important statements are confirmed by references to current and reliable scientific literature: confirmed. The important propositions and statements of the dissertation are supported by references to current, reliable and authoritative scientific literature. The

			dissertation candidate's review of scientific sources demonstrates deep command of the current state of the problem and the ability to critically reflect on existing scientific approaches. The theoretical part of the study relies both on the works of leading Kazakhstani researchers who have made significant contributions to the development of domestic linguistics, psycholinguistics and neurolinguistics, and on the works of recognised foreign specialists in bilingualism, multilingualism and cognitive neuroscience. The dissertation widely presents studies by Kazakhstani scholars: E.D. Suleimenova, Zh.K. Ibrayeva, A.M. Kustubayeva, M.K. Zholdassova, A.D. Zhakupova, Zh.S. Smagulova, and Sh.K. Zharkynbekova. Alongside this, the author consistently refers to the works of foreign researchers, including J. Kroll, E. Stewart, T. Dijkstra, W. Van Heuven, D. Green, J. Abutalebi, B. Hammarberg, C. Bardel, Y. Falk, J. Rothman, M. Kutas, K. Federmeier, S. Luck and others. This indicates that the dissertation research is embedded in international scientific discourse and that the author seeks to consider the problem under study in a broad theoretical context. It should be especially noted that the references to scientific literature in the dissertation are not formal and are not reduced to a simple presentation of other authors' opinions. The results of the analysis of scientific sources are used by the dissertation candidate to identify existing scientific debates, determine the methodological foundations of the study, justify the choice of experimental procedures and interpret the results obtained. In the practical part of the dissertation, the author compares propositions formulated on the basis of literature analysis with the results of her own experimental research. In particular, behavioural indicators (response accuracy and reaction time), congruency and incongruency effects, and electrophysiological indicators including the N400 component are subjected to comprehensive analysis. The data obtained allow the author to interpret in a reasoned manner the features of cross-language activation and lexico-semantic processing in Kazakh-Russian-English trilinguals, relating them to existing theoretical models and results of previous studies. Thus, the main statements of the dissertation are supported by modern and reliable scientific sources as well as by the results of the author's own experimental research, which indicates a high degree of substantiation and reliability of the conclusions presented.
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		8.5 Used literature sources are sufficient/not sufficient for a literature review	A sufficient number of scientific sources was used in the dissertation to conduct a full-fledged literature review. The bibliography includes 228 titles in Kazakh, Russian and English, which indicates a broad coverage of scientific literature and a high degree of elaboration of the problem under study. The literature review presents both classical works that laid the foundations of modern views on bilingualism, multilingualism and neurocognitive mechanisms of language processing, and recent studies reflecting current trends in the development of psycholinguistics, neurolinguistics and cognitive neuroscience. This allows the author to trace the evolution of scientific views and to determine her own research position in a justified manner. Special attention should be paid to the author's engagement with works by representatives of different scientific fields: linguists, psycholinguists, specialists in cognitive neuroscience, neuropsychologists, psychologists and researchers of the biological foundations of brain functioning. Such an interdisciplinary approach confirms the integrative nature of the dissertation research and corresponds to current trends in the development of neurolinguistics as a field of knowledge formed at the intersection of the humanities and natural sciences. The theoretical and methodological basis of the work covers a wide range of issues, including problems of multilingualism and trilingualism, mechanisms of lexico-semantic processing and cross-language activation, models of cognitive control, issues of language dominance, and the application of EEG/ERP methodology in studies of language and the brain. The sources used are relevant to the subject of the study and provide a sufficient theoretical basis for formulating research questions, choosing methodology and interpreting the results obtained. It should be noted that the literature review is not descriptive in nature. The author critically analyses existing scientific approaches, identifies debatable aspects of the problem and substantiates the need to conduct research specifically on the material of Kazakh-Russian-English trilingualism. This makes it possible to conclude that the source base used is sufficient and of high scientific value.
9	Practical value principle	9.1 The thesis has theoretical value: 1) yes; 2) no	The dissertation has undoubted theoretical significance. The conceptual apparatus of the study, the results of the analysis conducted, the methodology proposed by the dissertation candidate and the

			experimental data obtained will, in our view, contribute to the further resolution of a number of theoretical issues in psycholinguistics, neurolinguistics, the theory of bilingualism and multilingualism, as well as cognitive neuroscience. The theoretical significance of the work lies, above all, in refining modern views on the mechanisms of lexico-semantic access under trilingualism. The dissertation expands existing ideas about the nature of cross-language activation and demonstrates that third-language processing is a dynamic process dependent on language biography, the sequence of language acquisition and the features of language experience. A substantial theoretical contribution is the integration of psycholinguistic models of multilingual processing with neurophysiological data obtained using the ERP method. The work demonstrates the possibilities of using the N400 component as an indicator of semantic processing and cross-language interaction, thereby contributing to the development of experimental neurolinguistics in Kazakhstan. The author's interpretation of differences in the organisation of the trilingual lexicon through the forked route and roundabout route models also has theoretical value. Despite the need for further testing of the universality of these models, they open new prospects for discussing the roles of language experience, language dominance and the sequence of language acquisition in the organisation of the multilingual lexicon. Special attention should be paid to the dissertation candidate's work on systematising and developing the metalanguage of neurolinguistics and psycholinguistics in the Kazakhstani scientific space. The introduction and adaptation of modern terminology in the Kazakh language contributes to expanding the possibilities of using Kazakh as a language of science and to the inclusion of domestic researchers in international scientific discourse. Thus, the results of the dissertation research have significant theoretical importance, going beyond the description of an individual experimental case and contributing to the development of modern views on the neurocognitive mechanisms of processing several languages.
		9.2 The thesis is of practical importance and there is a high probability of applying the results obtained in practice: 1) yes; 2) no	The dissertation has practical significance and there is a high probability that the results obtained will be applied in practice: yes. The probability of applying the obtained results in practice appears high. The practical significance of the study goes beyond linguistics proper and concerns related areas of psycholinguistics, neurolinguistics, cognitive

			neuroscience, pedagogy and the theory of multilingual education. We especially emphasise the significance of the obtained results for applied psycholinguistics and neurolinguistics. The proposed experimental approach makes it possible to record not only the behavioural reactions of participants but also neurophysiological markers of meaning processing. This creates a basis for the further development of psycholinguistic and neurolinguistic methods for assessing language dominance, cross-language activation and features of first-, second- and third-language processing in bilinguals and trilinguals. The high probability of practical application of the results is also connected with the fact that the study is oriented towards the real language situation in Kazakhstan, where Kazakh, Russian and English function in educational and social practice. The obtained data can be used in designing multilingual education programmes, developing teaching materials, selecting language material for experimental and educational purposes, and creating diagnostic procedures for assessing lexico-semantic processing in multilingual speakers. The extension of the proposed methodology to studies of language acquisition and child speech appears especially promising. The combination of behavioural methods and ERP technologies opens possibilities for studying the development of lexico-semantic mechanisms in bilingual and trilingual children, identifying age-related features of cross-language activation, investigating the formation of language dominance and the dynamics of interaction among several languages at different stages of ontogenesis. The use of such methods may contribute to the development of objective diagnostic tools for assessing children's language development under multilingualism, as well as scientifically grounded approaches to supporting early and school multilingual education. The practical significance of the results may also manifest itself in the development of interdisciplinary research at the intersection of linguistics, psychology, pedagogy and the neurosciences, expanding the possibilities of applying experimental methods in the study of language and its acquisition.
		9.3 Are the practice suggestions new? 1) completely new; 2) partially new (25-75% are new); 3) not new (less than 25% are new)	The proposals for practice are new: completely new. The proposals for practice formulated in the dissertation are completely new, since they are based on the author's original experimental design and own empirical data. The work proposes a scientifically grounded experimental platform for

			studying trilingual lexico-semantic processing using the translation recognition paradigm in combination with event-related potential (ERP) methodology. The proposed approach can be used in subsequent psycholinguistic and neurolinguistic studies involving speakers of Kazakh, Russian, English, as well as other typologically and genetically different languages. The developed principle of selecting and organising stimulus material has practical value. The approach used in the dissertation makes it possible to adapt various lexical and grammatical units for the analysis of language processing in bilingual and trilingual groups, expanding the possibilities of experimental study of cross-language activation and lexico-semantic access. The results obtained and the conclusions formulated can be used in contrastive linguistics, psycholinguistics, neurolinguistics and language didactics, including in the design of multilingual education programmes, the development of diagnostic procedures for assessing features of language processing, and the creation of experimental methods for studying the language experience of multilingual speakers. The application of the proposed methodology in studies of language acquisition and child speech appears especially promising. The use of a combination of behavioural methods and ERP technologies creates prerequisites for studying the development of lexico-semantic mechanisms in bilingual and trilingual children, assessing the formation of language dominance, investigating the age dynamics of cross-language activation, and developing objective diagnostic tools for studying multilingual language development. It is important to note that the proposals for practice are based not on general theoretical recommendations but follow directly from the results of the conducted experiment, are confirmed by the empirical data obtained, and have high potential for further application in scientific and educational practice.
10.	The quality of writing and design	Academic writing quality: 1) high; 2) average; 3) below average; 4) low.	The quality of writing and formatting of the scientific text is high. The dissertation is formatted according to the international APA (American Psychological Association) standard, which corresponds to the requirements for the structure, volume and formatting rules for dissertations in all fields of science and technology in the Republic of Kazakhstan and to the "Instruction for Formatting a Dissertation", according to which the list of cited literature in English may be formatted using international citation

			styles, including APA Style. The structure of the dissertation includes definitions, a list of abbreviations, an introduction, three chapters, a conclusion, a list of references and appendices, which confirms that the work meets the established requirements for the structure of dissertation research.
11.	Notes on a thesis		Remarks on the dissertation Overall, the dissertation makes a highly favourable impression, is distinguished by a high scientific level and contains no fundamental shortcomings that could affect its overall positive assessment. At the same time, in the course of reviewing the dissertation, one question and a number of recommendations arose; they are discussion-oriented in nature and may be taken into account by the author in further research. Question. How might the proposed experimental model be expanded in the future to study not only individual lexical units but also more complex linguistic structures - phrases, sentences and discourse fragments - under Kazakh-Russian-English trilingualism? Will the identified patterns of cross-language activation and the features of N400 effects persist at higher levels of language processing, including syntactic and discourse integration? Recommendation 1. It seems advisable to continue the study by expanding the participant sample and including additional objective indicators of language competence for each of the three languages. This recommendation is due to the fact that language experience, degree of language proficiency and functional use of a language may influence the nature of cross-language activation and lexico-semantic processing. The use of standardised language tests and quantitative indices of language dominance would make it possible to describe in more detail the contribution of an individual language profile to the formation of the identified effects and to increase the precision of interpreting differences between the groups studied. Recommendation 2. The choice of English irregular verbs as stimulus material is of scientific interest. Traditionally, this category of words is associated with the study of morphological processing and mechanisms of grammatical representation, whereas in the study under review the main attention is given to processes of lexico-semantic verification, and infinitive forms of verbs are used as stimuli. In this regard, it appears promising to test the stability of the obtained results using other lexico-grammatical categories - regular verbs, nouns, adjectives, as well as more complex linguistic constructions. This would make it possible to establish whether the

			identified effects are a universal characteristic of trilingual processing or are to some extent conditioned by the specificity of the selected stimulus material. The question and recommendations expressed do not reduce the scientific value of the dissertation research and do not affect its overall positive assessment. On the contrary, they indicate the scientific promise of the research direction proposed by the author and open opportunities for further development and deepening of the results obtained.
12.	Scientific level of the doctoral student's articles on the topic of research (in case of defense of the dissertation in the form of a series of articles, the official reviewers comment on the scientific level of each article of the doctoral student on the topic of research)		The scientific level of the doctoral candidate Zhaksylykkyzy K.'s articles on the stated research topic is high. Within the framework of the research, 9 scientific works have been published, including 1 article in a journal indexed in the Scopus database and belonging to Q1, 5 articles in publications recommended by the Committee for Quality Assurance in Science and Higher Education of the Republic of Kazakhstan, and 3 publications in the proceedings of international and republican scientific conferences. In addition, a trilingual learner's dictionary of terms in psycholinguistics and neurolinguistics has been published on the research topic, confirming the doctoral candidate's contribution not only to the empirical study of trilingualism, but also to the development of the terminological base of neurolinguistics in Kazakhstan. The published works reflect the main theoretical, methodological and experimental results of the dissertation.
13.	Decision of the official reviewer (pursuant to paragraph 28 of the present Model Regulations)		On the basis of the above, I consider that the dissertation by Karlygash Zhaksylykkyzy entitled «Neurolinguistics of trilingualism: markers of lexico-semantic processing in cross-language interaction» fully complies with all requirements of the «Rules for Awarding Degrees», and that its author deserves to be awarded the degree of Doctor of Philosophy (PhD) under the educational programme «8D02303 – Linguistics».

In reviews, official reviewers indicate one of the following solutions:

- 1) to award the degree of Doctor of Philosophy (PhD) or Doctor of Specialization;
- 2) send the thesis for revision (except for cases of thesis defense in the form of a series of articles);

- 1) to award the degree of Doctor of Philosophy (PhD) or Doctor of Specialization;
- 2) send the thesis for revision (except for cases of thesis defense in the form of a series of articles);
- 3) refuse to award the degree of Doctor of Philosophy (PhD) or Doctor of Specialization.

Copies of the reviews of the official reviewers are handed over to the doctoral student no later than 5 (five) working days before the defense of the thesis.

Official Reviewer:

Doctor of Philological Sciences, Professor,
Vice-Rector for Research and Regional Cooperation
NJSC «Kokshetau University named after Sh. Ualikhanov»
(place of work, academic title)



Zhakupova Aigul Doszhanovna
(FULL NAME)