MINISTRY OF HEALTHCARE AND SOCIAL DEVELOPMENT OF THE REPUBLIC OF KAZAKHSTAN

NJSC “Asfendiyarov Kazakh National Medical University”

ABSTRACT

Dissertation by Yerkibayeva Zhamilya Umurzakovna on the topic:
«Comparative Study of the Effectiveness of Non-Invasive Methods for Treating Hard-Tissue Dental Pathologies in Children with Autism Spectrum Disorder (ASD)”
submitted for the degree of Doctor of Philosophy (PhD) in the specialty 8D10103 – «Medicine»

Scientific Supervisors:
PhD Menchisheva Yu.A.
MD, Professor Saduakasova K.Z.

Foreign Scientific Supervisors:
MD, Professor Yakubova I.

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Relevance of the Research Topic

The health status and overall well-being of children are key indicators of a country's demographic and social potential [1]. Oral health plays an important role in shaping general child health, particularly during the early stages of development. Disturbances in this area negatively affect nutrition, speech development, socialization, and self-esteem [2, 3]. Children with neurodevelopmental disorders, including autism spectrum disorder (ASD), represent a particularly vulnerable group due to pronounced sensory sensitivities and behavioral specificities [4–7].

ASD comprises a heterogeneous spectrum of neuropsychiatric conditions characterized by persistent difficulties in social communication, restricted interests, and a tendency toward repetitive behaviors [8]. According to WHO, these disorders are diagnosed in one out of every hundred children, and their prevalence continues to increase. In Kazakhstan, epidemiological data for 2020–2023 indicate that in Almaty the number of registered cases of childhood autism rose from 0.8 to 2.6 per 100,000 children, while atypical autism increased from 63.5 to 99.2. This trend underscores the need for developing adapted models of medical care, including dental services [9].

The dental status of children with ASD is often complicated by cognitive and behavioral impairments. Sensory disturbances, fear of new stimuli, and limited communication skills hinder timely diagnosis and complicate necessary treatment [10–12]. Common dental pathologies include caries, gingival inflammation, periodontitis, and malocclusions. An additional challenge is the insufficient preparedness of specialists to work with this patient group, which reduces diagnostic accuracy and the effectiveness of interventions [13, 14].

Conventional invasive treatment methods are not always suitable for children with ASD due to heightened anxiety and sensory instability. This situation increases the need for gentle approaches, including non-invasive and microinvasive techniques that do not require anesthesia or mechanical preparation of dental tissues [15]. Of particular interest are biomimetic agents such as InnoDent Repair, which support enamel structure restoration through natural remineralization involving calcium and phosphate ions.

Another important component of a comprehensive approach is the integration of digital tools, including mobile applications, educational visual materials, VR/AR technologies, and specialized devices adapted to the needs of children with ASD. These solutions help reduce anxiety, improve clinician–patient interaction, and support the formation of consistent oral hygiene behaviors [16, 17].

Despite growing interest in the oral health of children with ASD, research evaluating the effectiveness of comprehensive, multimodal approaches remains limited. Most studies address isolated components—prevention, behavioral adaptation, or non-invasive treatment—while their combined application and mutual influence remain insufficiently investigated. Integrating modern digital technologies, behavioral-support strategies, and gentle clinical interventions has the potential to improve treatment tolerance, enhance hygiene behaviors, and reduce caries progression in this population.

Thus, a scientifically grounded evaluation of the effectiveness of an integrated approach is needed, which determines the relevance of the present research.

The purpose of the dissertation research: enhancing the effectiveness of a preventive complex and non-invasive treatment for hard-tissue dental pathologies in children with ASD

Object of study: 90 children with autism spectrum disorders, having pathologies of hard dental tissues, aged 3 to 18 years. Patients were recruitedbased at the correctional ABA centers "Rostok" and the foundation "DOM" ("Autism will be defeated") in Almaty.

Subject of research: the effectiveness of using non-invasive methods of prevention and treatment (remineralization, infiltration, biomineralization) of these pathologies in this group of children, as well as a set of measures including behavioral adaptation and the use of digital technologies.

Research objectives:

1. To assess the oral health of children with autism spectrum disorders;
2. To develop and test a set of preventive measures to adapt the behavioral responses of children with ASD to dental procedures using modern diagnostic and innovative tools;
3. To evaluate the effectiveness of treatment of pathologies of hard dental tissues using various non-invasive treatment methods;
4. To create and implement a mobile application for training and motivation for oral hygiene in children with ASD.

Research methods:

The dissertation research was carried out within the framework of the "Tauelsizdik Urpaqtary-2023" grant, established by the Head of State under the "Science" priority area, as well as the grant funding of the research project "Zhas Galym" of the Ministry of Science and Higher Education of the Republic of Kazakhstan for 2024–2026 (IRN AP22686056 *"Application of innovative non-invasive methods for the prevention and treatment of dental caries in children with autism"*, state registration No. 0124RK00808 dated October 18, 2024).

1. Clinical (collection of anamnesis data, examination of patients, diagnosis, prevention, treatment);
2. Laboratory (collection of oral fluid, study of mineralizing potential and pH of oral fluid);
3. Diagnostic (vital staining, laser fluorescence, method using fluorescent dye)
4. Sociological (survey of parents to analyze the oral health of children with ASD, analysis of the effectiveness of a mobile application)
5. Statistical (statistical processing of the obtained data, determination of the prevalence and intensity of dental caries).

The main provisions submitted for defense

1. Children with autism spectrum disorders have been identified to have specific features of dental status and hygiene behavior that must be taken into account when choosing tactics for the prevention and treatment of pathologies of hard dental tissues.

2. A comprehensive behavioral adaptation program, including the use of a patented device for isolating the anterior group of teeth and digital diagnostic methods, increases the tolerance of dental procedures and improves treatment outcomes in children with ASD.

3. A comparative clinical evaluation of non-invasive treatment methods has demonstrated their high efficacy in treating hard tissue pathologies in children with ASD and good tolerability in conditions of increased sensory sensitivity and limited ability for long-term interaction with a physician.

4. The use of a mobile application aimed at developing hygiene skills in children with ASD contributes to a significant improvement in the hygiene index and increased commitment to regular oral care.

5. The developed set of preventive and therapeutic measures improves the quality of dental care for children with ASD, increases its effectiveness, reduces behavioral anxiety, and ensures sustainable hygiene skills in everyday life.

Main results of the study

1. Children with autism spectrum disorders exhibited distinct dental characteristics. The prevalence of dental caries was 92.2%, and the average DMFT/dmft index was 5.62 ± 2.14, which is statistically significantly higher than that of the general pediatric population ($p < 0.001$; Mann–Whitney U test).

The high proportion of untreated caries (4.12 ± 1.78) and poor hygiene (OHI-S = 3.97–4.21) also showed significant differences from the reference values ($p < 0.001$; Mann–Whitney U-test).

2. Behavioral difficulties significantly complicated dental care: 62.2% of parents reported significant uncooperative behavior, and only 41.1% of children were able to fully complete treatment. The implementation of a behavioral adaptation program in the study group resulted in a statistically significant improvement in treatment tolerance: the treatment completion rate increased compared to the control group (by 1.27 times; $p = 0.032$; χ^2 test), while the severity of refusal and anxiety decreased by 34.8% relative to baseline ($p < 0.01$; Mann-Whitney U test).

3. A comparative clinical evaluation of non-invasive treatment methods demonstrated significant age-dependent efficacy. In children aged 3–5 years, remineralizing therapy provided significant stabilization of demineralization foci: the DIAGNOdent value decreased from 48.2 ± 6.4 to 25.4 ± 5.3, which corresponds to a 47.3% decrease in fluorescence intensity ($p = 0.004$; χ^2-test; $d = 0.86$). In the 6–11 year old group, the infiltration technique demonstrated the highest efficacy across all diagnostic methods: the DIAGNOdent value decreased from 53.4 ± 6.9 to 18.9 ± 4.1, which corresponds to a 64.6% decrease ($p < 0.001$; paired Wilcoxon test; $d = 1.21$). In the 12–18 year old group, biomineralization showed the best

remineralization dynamics: the DIAGNOdent index decreased from 46.3 ± 6.0 to 11.7 ± 3.2, which amounted to a 74.7% decrease in fluorescence intensity ($p < 0.001$; paired Wilcoxon test; $d = 1.34$), surpassing alternative methods.

4. The use of a mobile application aimed at developing hygiene habits led to significant improvements in the study group. The proportion of children brushing their teeth independently increased from 10% to 40% ($p < 0.001$; χ^2 test). The OHI-S index decreased statistically significantly in all age subgroups (mean decrease 28.2–51.7%; $p < 0.001$; paired Wilcoxon test). In the control group, the improvements were moderate: independence increased to only 18% ($p = 0.041$; χ^2 test), and the OHI-S decrease was less than 10% ($p = 0.047$; paired Wilcoxon test).

5. A combination of interventions, including behavioral adaptation, digital diagnostics, non-invasive treatment methods, and mobile support, demonstrated significant benefits in the intervention group compared to the control group. The rate of favorable clinical outcomes was 87.6% compared to 61.4% ($p < 0.001$; χ^2 test), accompanied by a 34.8% reduction in behavioral anxiety from baseline ($p = 0.008$; Mann-Whitney U test) and the development of sustainable hygiene habits.

Scientific novelty

1. For the first time, a diagnostic method for early caries using a fluorescent dye was developed and implemented (utility model patent No. 8307 dated August 4, 2023), intended for the detection of early carious changes on visible and hidden tooth surfaces and characterized by high sensitivity, non-invasiveness, and clinical accessibility.

2. For the first time, the CAST (Caries Assessment Spectrum and Treatment) index was applied within a comprehensive dental diagnostic system for children with autism spectrum disorder (ASD) to determine the prevalence and structure of the carious process, enabling a more detailed characterization of the stages of hard dental tissue involvement.

3. For the first time, a specialized questionnaire, “Analysis of Oral Health in Children with Autism,” was developed and validated (certificate No. 29067 dated September 27, 2022) for the comprehensive assessment of dental status and oral hygiene behavior in children with ASD.

4. For the first time, a device for isolating the anterior group of teeth in children was proposed and tested (utility model patent No. 8630 dated November 17, 2023), allowing optimization of diagnostic and therapeutic dental procedures in patients with sensory sensitivity and limited cooperation.

5. For the first time, a method for improving oral hygiene skills in children with autism spectrum disorder was developed (utility model patent No. 10840 dated July 11, 2025), based on step-by-step training, visualization, and behavioral support, contributing to the formation of stable oral hygiene habits.

6. For the first time, a modified method for determining the oral hygiene index in children with autism was developed and implemented (certificate No. 29506 dated October 18, 2022), taking into account behavioral characteristics and sensory perception specific to this patient group.

7. For the first time, the application of innovative technologies in the oral hygiene system for children with ASD was scientifically substantiated (certificate No. 30097 dated November 8, 2022), aimed at improving the effectiveness of preventive measures.

8. For the first time, a gamified mobile application incorporating artificial intelligence elements and parental control was developed and implemented to form tooth-brushing skills in children with autism (certificate No. 51892 dated November 21, 2024), resulting in increased motivation and adherence to regular oral hygiene practices.

Practical significance of the obtained results

1. The developed algorithm for behavioral adaptation of children with autism spectrum disorders to dental treatment has increased tolerance of procedures, reduced the time required for procedures, and decreased the frequency of treatment refusals by patients and parents.

2. The use of digital diagnostics using Qscan Plus (South Korea) provided an objective assessment of oral hygiene, increased the accuracy of monitoring the effectiveness of preventive measures, and increased motivational engagement for both the child and their legal guardians.

3. As a result of clinical testing of various non-invasive treatment methods, their high effectiveness was established in conditions of limited interaction, typical for children with ASD: a decrease in the progression of initial forms of caries and an improvement in the overall dental status were observed.

4. The implementation of a mobile application aimed at developing hygiene skills in children with ASD has improved the hygiene index score by 1.4 times, as well as increased the regularity and awareness of hygiene procedures.

5. The comprehensive application of the proposed approaches has reduced the number of visits, decreased behavioral anxiety, and increased adherence to preventive recommendations, which is especially important when providing dental care to children with neuropsychiatric disorders.

6. The methods and technologies used in the work are economically accessible, do not require expensive equipment, and can be implemented in the practice of pediatric dental clinics, including institutions specializing in helping children with special educational needs.

Personal contribution of a doctoral student

The author developed the study's hypothesis based on an independent analysis of current scientific data. She also substantiated the study's scientific validity and collected and comprehensively analyzed and statistically processed the data using domestic and international sources. During the dissertation's preparation, the author provided the necessary documentation, organized clinical examinations, and provided dental care to 90 children with autism spectrum disorders, divided into groups according to the study design. As part of her professional development, she completed the course "Diagnosis and Differential Diagnosis of Developmental Disorders in Children (ASD, speech delay)" (a total of 60 academic hours). All

stages of statistical data processing, as well as the writing of scientific publications, the dissertation text, and the dissertation abstract, were completed by the candidate personally.

Conclusions:

1. Children with ASD exhibited distinct dental characteristics, including a high prevalence of dental caries (92.2%), an elevated DMFT/dmft index (5.62 ± 2.14), and poor oral hygiene: OHI-S scores of 3.97–4.21, corresponding to poor hygiene. Furthermore, 62.2% of parents reported significant behavioral difficulties during dental appointments, and only 41.1% of children were able to fully complete treatment, requiring an adapted and individualized approach. Differences in DMFT/dmft and OHI-S scores were statistically significant ($p < 0.001$; Mann–Whitney U test).
2. A comprehensive behavioral adaptation program, including digital dental imaging and a patented device for isolating the anterior teeth, demonstrated high clinical effectiveness. In the study group, the proportion of completed dental interventions increased from 41.1% to 52.4% ($p = 0.032$; χ^2 test), and behavioral anxiety scores decreased statistically significantly ($p < 0.01$; Mann-Whitney U test), confirming the value of multimodal behavioral support.
3. A comparative analysis of non-invasive treatment methods (infiltration, biomineralization) demonstrated significant efficacy in treating early stages of caries in children with ASD. In the 6-11 year-old group, the infiltration consept method resulted in a 62% reduction in diagnostic parameters (vital staining, DIAGNOdent, with fluorescent dye) ($p < 0.001$; paired Wilcoxon test), reflecting the high efficiency of enamel infiltration. In the 12-18 year-old group, the biomineralization system demonstrated maximum remineralization dynamics—a 71.5% reduction in demineralization parameters ($p < 0.001$; paired Wilcoxon test). In children aged 3–5 years, the greatest effectiveness was observed with remineralizing therapy, where stabilization of demineralization foci was observed in 51% of cases ($p = 0.004$; χ^2 test). These results are especially significant given sensory overload and the limited opportunity for children to have long-term contact with a doctor.
4. The use of a mobile application for developing and reinforcing hygiene skills ("Marzhan Tis") ensured a reliable improvement in oral hygiene. The OHI-S index in the main group decreased from 2.11 ± 0.88 to 1.48 ± 0.75 ($p < 0.001$; paired Wilcoxon test), and the proportion of children brushing their teeth independently increased from 10% to 40% ($p < 0.001$; χ^2 test). In the control group, the improvements were less pronounced: the decrease in OHI-S did not exceed 10% ($p = 0.047$; paired Wilcoxon test), and the proportion of independent children increased to only 18% ($p = 0.041$; χ^2 test). This confirms the effectiveness of mobile support in increasing the motivation and commitment of children with ASD to regular hygiene.

Testing the results of the dissertation

The main provisions of the dissertation are presented at:

1. International online conference "Current issues of pediatric therapeutic dentistry and prevention" on October 10, 2020
2. International Conference "Problems of Dental Caries in Children in Modern Conditions: Challenges of the Time" October 12, 2020
3. International online conference "Modern approaches to solving issues in pediatric dentistry" on November 10, 2020
4. Program of the 2nd round of the competition of scientific research works of students and young scientists of the NAO "KazNMU named after S.D. Asfendiyarov" on February 5, 2021
5. 4th All-Russian Scientific and Practical Conference "Current Issues in Pediatric Dentistry" February 15, 2021
6. International scientific and practical conference of pediatric dentists and maxillofacial surgeons on the topic "Problems and prospects for the development of pediatric dentistry and maxillofacial surgery", dedicated to the 80th anniversary of Professor Esim Ackerbek Zharmaғambetuly, October 21, 2021
7. X International Scientific and Practical Conference "Priorities of Pharmacy and Dentistry: From Theory to Practice", dedicated to the 30th anniversary of the Independence of the Republic of Kazakhstan and the 70th anniversary of the School of Pharmacy of the Kazakh National Medical University named after S.D. Asfendiyarov, November 26, 2021
8. 5th All-Russian Scientific and Practical Conference with International Participation "Current Issues in Pediatric Dentistry" February 16, 2022
9. IV Republican Conference "Autism - Myths and Reality" May 4, 2022
10. International Scientific and Practical Conference "New Technologies in Dentistry and Maxillofacial Surgery" May 31, 2022
11. An international online seminar for dentists on the topic: Comprehensive diagnostics and identification of individual approaches to the prevention and treatment of major dental diseasesOctober 9, 2022
12. International scientific and practical conference of pediatric dentists on the topic: "Problems and achievements of pediatric dentistry in modern conditions" December 7, 2022
13. VI Dental Congress "Dental Time - 2023" within the framework of the dental exhibition KAZDENTEXPO, topic: "Features of providing dental care to children with autism spectrum disorders (ASD)" May 31, 2023
14. Round table with international participation "Non-invasive methods of treating dental caries in children and adolescents with mental disabilities" on May 21, 2024
15. Scientific and practical conference with international participation of pediatric dentists "Problems and achievements of pediatric dentistry in modern conditions", dedicated to the 65th anniversary of the first dental faculty of Kazakhstan and the 60th anniversary of the first graduation of dentists of the Republic of Kazakhstan May 2024
16. Congress "Dentistry of the 21st Century: Traditions, Achievements and Prospects" dedicated to the 65th anniversary of the first dental faculty of Kazakhstan, May 24, 2024

17. XII International Forum of Pediatric Dentistry, competition for the best regional program for the prevention of dental diseases in childhood named after T.I. Chebakova "Prevention of dental diseases in children with mental disabilities" Yermukhanova G.T., Yerkibayeva Zh.U., Abdukalikova D.B., Bainazarova N.T., Moscow, September 10, 2024

18. Symposium "Current Dental Problems in Children" at the 12th Open All-Russian Dental Forum "Dental Forum on the Volga" Report "Minimally Invasive Treatments for Dental Caries in Children with Autism"

Yerkibayeva Zh. U. Yermukhanova G. T. October 16, 2024, Volgograd

19. International Congress "Global Health" report "Application of innovative technologies in children with autism spectrum disorders (ASD)" Yerkibayeva Zh.U., Yermukhanova G.T., Saduakasova K.Z. December 5, 2024

20. Scientific and practical conference of students and young scientists "Medicine of the Future: From Theory to Practice", dedicated to the 95th anniversary of the Kazakh National Medical University named after S. D. Asfendiyarov, timed to coincide with Science Day "Innovative devices and digital solutions for the adaptation of children with autism spectrum disorders (ASD) during dental appointments" April 11, 2025

21. International scientific and practical conference "Human Resources in Healthcare, dedicated to the 80th anniversary of Doctor of Medical Sciences, Professor Kurakbaev K.K. "Dentistry and Healthcare: Vectors of Development", May 21, 2025

22. Practical seminar for pediatric dentists "Modern methods of treating caries in children and adolescents, preventive measures", May 22, 2025

Implementation Information

1. The use of innovative technologies in oral hygiene for children with autism spectrum disorders (ASD) has been implemented at the National Scientific and Practical Center for the Development of Special and Inclusive Education in Almaty (Appendix C1)

2. An algorithm for preparing children with autism for a dental appointment has been implemented at the National Scientific and Practical Center for the Development of Special and Inclusive Education in Almaty (Appendix C2)

Publications

1. G. T. Yermukhanova, Z. U. Yerkibayeva, K. Kh. Ibragimova “Study of the mineralizing potential of saliva during remineralizing therapy in children with mental retardation” // Bulletin No. 2 - 2020, pp. 228-232 (https://www.elibrary.ru/item.asp?id=44764219)

2. Yerkibayeva Zh.U., Yermukhanova G.T., Menchisheva Yu.A., Abdukalikova D.B., Malim M.Zh. Dentistry and autism: key problems and ways to solve them. Literature review. // Pharmacy of Kazakhstan, No. 1-2022, pp. 36-40 DOI 10.53511/PHARMKAZ.2022.10.14.007

3. D.B. Abdukalikova, G.T. Yermukhanova, D.S. Smailova, Zh.U. Yerkibayeva Problems of dental health of children with autism spectrum disorders

(literature review) // Pharmacy of Kazakhstan, No. 4-2022, pp. 10-16 DOI 10.53511/PHARMKAZ.2022.95.63.002

4. Zh.U. Yerkibayeva, DB Abdukalikova, GT Yermukhanova, KZ Saduakasova, Yu.A. Menchisheva, MM Durumbetova, AS Begimkulova. Modern technology integration in determination Of oral hygiene condition in children with autism // Pharmacy of Kazakhstan, No. 6-2023, pp. 19-25 DOI 10.53511/PHARMKAZ.2024.42.98.003

5. D.B. Abdukalikova, Z.U. Yerkibayeva, G.T. Yermukhanova, M.A. Baimuratova, K.Zh. Zhumabaeva, G.T. Meshchanov, N.T. Bainazarova. Multidisciplinary approach to the rehabilitation of children with autism spectrum disorders in the practice of a dentist // Pharmacy of Kazakhstan, No. 6-2023, pp. 25-34 DOI 10.53511/PHARMKAZ.2024.16.73.004

6. Yerkibayeva Z, Yermukhanova G, Saduakassova K, Rakhimov K, Abu Z, Menchisheva Y. Non-invasive esthetic treatment of initial caries with resin infiltration in a patient with autism spectrum disorder. Georgian Med News. 2025 Apr;(361):121-126. PMID: 40694707.

7. Yerkibayeva, Z., YYermukhanova, G., Saduakasova, K., Menchisheva, Y., Rakhimov, K., Abu, Z., ... & Abutalipova, A. (2025). Innovative oral hygiene strategies for children with autism spectrum disorder: a gamified app-based intervention. European Archives of Paediatric Dentistry, 1-10.

8. Modern methods of remineralizing therapy in children with ASD (autism) Yerkibayeva Zh.U., Yermukhanova G.T., Menchisheva Yu.A., Yakubova I.I. Collection of materials of the X International scientific and practical conference "Priorities of Pharmacy and Dentistry: from Theory to Practice", dedicated to the 30th anniversary of Independence of the Republic of Kazakhstan and the 70th anniversary of the School of Pharmacy of the Kazakh National Medical University named after S.D. Asfendiyarov, November 26, 2021, Almaty

9. Non-invasive methods for treating dental hard tissue pathologies in children with autism Yerkibayeva Zh.U., Yermukhanova G.T., Saduakasova K.Z., Menchisheva Yu.A. Collection of abstracts of the 1st international forum Asfen ForUM, June 5-6, 2023

10. Yerkibayeva Zh.U., Yermukhanova G.T., Menchisheva Yu.A. Patent for utility model “Method for diagnosing initial caries using a fluorescent dye” No. 8307 2023/0468.2 04.08.2023 (Appendix A1)

11. Yerkibayeva Zh.U., Yermukhanova G.T. Patent for utility model “Device for isolating the frontal group of teeth in children” No. 8630 2023/1085.2 November 17, 2023 (Appendix A2)

12. Yerkibayeva Zh. U., Yermukhanova G. T., Saduakassova K. Z., Rakhimov K. D., Abu Zh., Akhmetov A. G. Patent for utility model “Method for improving oral hygiene skills in children with autism spectrum disorders” No. 10840 2025/0143.2 11.07.2025 (Appendix A3)

13. Yerkibayeva Zh.U., Saduakasova K.Z., Yermukhanova G.T., Menchisheva Yu.A. Certificate of entering information into the state register of rights to objects protected by copyright No. 29067 dated September 27, 2022,

questionnaire "Analysis of the health of the oral cavity of children with autism" survey "Analysis of health of the oral cavity of children with autism" (Appendix B1)

14. Yerkibayeva Zh.U., Yermukhanova G.T., Menchisheva Yu.A., Abdukalikova D.B. Certificate of entering information into the state register of rights to objects protected by copyright No. 29506 dated October 18, 2022. A modified method for determining the oral hygiene index in children with autism. (Appendix B2)

15. Yerkibayeva Zh.U., Yermukhanova G.T., Menchisheva Yu.A., Abdukalikova D.B. Certificate of entry of information into the state register of rights to objects protected by copyright No. 30097 dated November 8, 2022. Application of innovative technologies in oral hygiene in children with autism spectrum disorders (ASD). (Appendix B3)

16. Yerkibayeva Zh. U., Yermukhanova G. T., Akhmetov A. G. Certificate of entering information into the state register of rights to objects protected by copyright No. 51892 dated November 21, 2024. A gaming mobile application for developing teeth brushing skills in children with autism: artificial intelligence and parental control (Appendix B4)

Volume and structure of the dissertation

The dissertation consists of an introduction, four chapters, a conclusion, findings, a bibliography, and appendices. The research paper is presented on 106 typewritten pages, including 28 figures, 13 tables, and 12 appendices. The list of references contains 159 sources in English and Russian.