To the Chairman of the Scientific Jury,
determined by Order No. P-109-165/09.05.24
of the Rector of the MU - Varna

REVIEW

by

Prof. Zlatka Borisova Stoyneva-Paskaleva, MD, PhD

Faculty of Medicine – Sofia University "St. Kliment Ohridski" и Faculty of Medicine - MU – Plovdiv, member of the scientific jury according to Order No. P-109-165/09.05.24 of the Rector of the MU — Varna based on Protocol No. 1/16.05.24 of the first meeting of the scientific jury

of the PhD thesis

for awarding the educational and scientific degree "PhD"
in the field of education 7. "Health and sports", professional direction 7.1. "Medicine", scientific specialty "Physiotherapy, Resort therapy and Rehabilitation"

Author: Yasen Todorov Petrov MD
Admission: Full-time PhD Student
Scientific organization: Medical University (MU) "Prof. Dr. Paraskev Stoyanov" – Varna
Topic: A Comparative Study of the Effects of Deep Oscillation and Physical Therapy Modalities in Patients with Cervical Spondylosis
Thesis supervisor: Assoc. Prof. Mariyana Mihaylova Krasteva-Ruseva, MD, PhD.

I. Defense Procedure

The presented set of documents is in accordance with the Regulations for the acquisition of the educational and scientific degree "PhD" in the MU - Varna.

Dr. Yasen Todorov Petrov has gone through all the procedures stipulated in the Regulations for the Development of the Academic Staff (RDAS) of the MU - Varna. Protocol No. 25/25.05.2024 was provided by the Departmental council of the Department of "Physiotherapy, Rehabilitation and Sea Therapy" at the MU of Varna, where a decision was made to graduate the PhD student with the right to public defense. By Order No. P-109-165/09.05.24 of the Rector of the MU - Varna on the basis of a report with No. 102-1196/26.04.2024 by Associate Professor Mariyana Mihailova Krasteva-Ruseva, PhD — Head of the "Physiotherapy, Rehabilitation and Sea Therapy" department, by decision of the Faculty Council of the Faculty of "Public Health" at the MU — Varna according to Order No. 224/07.05.2024 on the basis of Art. 24, para. 6 and Art. 30, para. 3 of the Regulations for the Implementation of the Law on the Development of the Academic Staff in the Republic of Bulgaria (LASDRB), art. 68, para. 1 of the PRAS in the MU - Varna is deducting with the right of defense Dr. Yasen T. Petrov – full time PhD student in the PhD program "Physiotherapy, spa treatment and rehabilitation", professional direction 7.1 Medicine, enrolled with Order No. P-109 -507/04.11.2020.

Copies of the Protocol dated 07/23/2021 regarding a successfully passed exam to meet the PhD minimum in a foreign language on the Blackboard platform with proficiency at a minimum level of B1 (CEFR) have been provided in compliance with Order No. P-100-432/12/07/2021 of the Rector of the MU of Varna and Protocol of 20.05.2021 for a successfully passed exam to cover the doctoral minimum in the specialty: "Physical and Rehabilitation Medicine" in compliance with Order No. P-109-

161/20.04.2021 of the Rector of MU - Varna.
Dr. Petrov holds the mandatory ORCID registration profiles with ID 0000-0002-4923-2430 and in Google Scholar Internet address: https://scholar.google.com/citations?user=-dqkkIzkAAAAJ&hl=en&oi=ao
The PhD student has presented three publications related to the topic of the dissertation.

II. Brief Biographical Data and Career Development

Dr. Yasen Todorov Petrov was born in 1994 in the city of Varna, where he completed his secondary education in 2013. In 2019, he graduated as a "master" in the specialty "Medicine" at the MU of Varna (Registration No. 006826/2019, MU — Varna). In his quest for continuous development and improvement, Dr. Petrov has taken part in a number of qualifying thematic courses for postgraduate training: Orthopedic Medicine - Cyriax; Deep Oscillation; Aromatherapy; Innovative Educational Technologies, etc., as well as in: Pedagogical Competence; Legal Framework Regulating the Education of Doctoral Students; Research Methodology; Research Ethics; Statistical Methods for Data Processing and Presentation; Communication Techniques and Presentation Skills, etc.
The professional path of Dr. Petrov began in 2019 at the Center for Emergency Medical Assistance - the city of Varna. At the same time, he also worked as a doctor at the Medical Center for Rehabilitation and Sports Medicine - Varna. In 2020, after winning a competition, he started specialization in "Physical and Rehabilitation Medicine" at the MU - Varna and was appointed as an assistant professor at the Department of "Physiotherapy, Rehabilitation and Sea Therapy" at the MU - Varna and as physician at the Department of Rehabilitation of the Clinic of Physical and Rehabilitation Medicine in University Hospital "St. Marina" EAD - Varna.
His main professional and scientific interests are in the treatment of degenerative joint diseases and sports injuries.
Dr. Petrov is fluent in written and spoken English.
He is a member of the Bulgarian Medical Association, and the Association of Physical and Rehabilitation Medicine.

III. Publications and Scientific Aьxactivity

Dr. Yasen Petrov is the author of 3 full-text scholarly publications in one foreign and two Bulgarian periodicals on the problem of his thesis. He is the first author of the three publications, which testifies to his leading role in conducting the research, preparing the publications and presenting the scientific results in the scientific articles. The publications are in 2022, 2023 and 2024, which reflects the topicality of the subject.

IV. Structure of the PhD Thesis

The thesis submitted for review is logically structured and conforms to the accepted standards of a dissertation for obtaining the educational and scientific PhD degree. It is developed in a volume of 205 standard pages and is richly illustrated with 47 tables and 68 figures. Includes: table of contents (3 pages), abbreviations (1 page), introduction (2 pages), literature review (69 pages), aim and objectives (2 pages), material and methods (10 pages), results (49 pages), discussion (12 pages), conclusion (2 pages), illations (2 pages), contributions (1 page), publications related to the dissertation work (1 page), bibliography (19 pages) and 3 appendices (18 pages).
The bibliographic reference contains 336 sources, of which 29 in Cyrillic and 307 in Latin, and is very

up-to-date considering that about 40% of the cited sources are from the last decade, and 18% - from the last five years.

V. Evaluation of the Relevance of the Thesis

The significance of the presented thesis is predetermined by the choice of topic regarding the effect of the applied relatively new physical modality, namely the unique patented physiotherapeutic method of deep oscillation (DO) with the impact of low-frequency pulses obtained from electrostatic attraction and friction on the treated painful tissue in the widespread nowadays cervical spondylosis - one of the most common imaging-detected degenerative changes of the spine, affecting 85% of people over 60 years of age, although most asymptomatic. The prevalence of cervical spondylosis is constantly increasing not only among the elderly population, but increasingly also among middle-aged and young people. It is the most common musculoskeletal cause of neck pain, causing reduced work capacity and sometimes disability, and it definitely negatively affects the quality of life of the ill and is undoubtedly a source of costs not only for the patients, but also for their families, business, insurance and health systems. The therapeutic approaches of the degenerative pathology of the cervical spine, which is widespread among the population, is a current problem not only in our country, but also in the world. More and more patients are looking for natural, safe and gentle remedies with proven therapeutic effects and efficacy in the treatment and prevention of this increasingly common pathology in the modern digital world of computerized life and work, a world of chemical pollutants in the environment and additives in food.
Deep oscillation therapy improves local microcirculation, lymphodynamics, functionally restores tissues, which is why it has trophic, anti-inflammatory, antifibrotic and analgesic effects. These effects have been insufficiently studied in its parallel application of therapy in combination with physical factors for the treatment and prevention of patients with cervical spondylosis.
The significance and relevance of the problem developed in the thesis in scientific and scientific-applied terms are undoubted.

VI. Literature Review

The literature review is extensive, multifaceted, analytical and thorough. The presentation follows a logical sequence, presents the anatomical and physiological characteristics and biomechanical features of the cervical spine, synthesizes and discusses the published foreign and Bulgarian experience regarding the genesis, the current state and development trends in the problems of cervical spondylosis and the related pain syndrome, the treatment course and the resulting risk to patients' health and quality of life. A number of insufficiently clarified aspects and still controversial issues are highlighted, especially regarding accurate and effective therapy of the pain syndrome in the neck with the means of pathogenetic and symptomatic treatment with pharmaceutical products, physical therapy and surgical interventions. The device and the modes of operation of the used equipment are comprehensively presented, as well as the characteristics, parameters and interactions with the treated biological tissues. Historically, the clinical experience with the studied modality is presented, as well as with the routine physical methods used to compare therapeutic effectiveness.
The literature review presents the author as a well-informed researcher with critical thinking and a creative approach. Dr. Petrov has managed to synthesize the vast amount of information, skillfully analyze the available specialized literary sources and present the controversial and poorly clarified issues. All this allows him to formulate, in accordance with modern scientific research in this direction, a clear scientifically based **goal** of his work: "To study the effect of the combined

application of Deep Oscillation and some physical factors and to compare it with a combination of routine physical factors applied to treat patients with cervical spondylosis".

The Tasks are specific and realistic, well-defined and adequate to solve the set goal, namely: to study the short-term and long-term therapeutic effect of combined applied DO, transcutaneous electrical nerve stimulation (TENS) and kinesitherapy in patients with cervical spondylosis and to compare them with ultrasound, TENS and kinesitherapy, as well as with placebo TO, TENS and kinesitherapy, analyzing subjective and objective indicators, side effects.

VII. Materials and Methods

The study included 121 patients with imaging-verified cervical spondylosis who met well-defined criteria, aged between 18 and 55 years. The contingent was divided into three therapeutic groups: "A" composed of 44 patients, "B" - of 39 patients and "C" - of 38 patients, treated with the three programs of physical methods, respectively, described in the above-mentioned tasks. The examinations were performed before the start of the treatment and after completion of the therapeutic course on the 10th and 45th day from the start of treatment and included: assessment of static and dynamic pain using the visual analog scale (VAS); assessment of muscle tone using a specially developed three-level scale; measurement of the range of motion (antero-, retro-, right-sided and left-sided lateroposition and rotation) in the cervical spine by goniometry; objectification of the psycho-emotional state by means of the Zung test; determining quality of life using the modified Neck Disability Index (NDI) questionnaire. For a complete and reliable analysis of the obtained results, modern statistical methods were appropriately chosen, using the program product SPSS Statistics for Windows v. 29.0.

VIII. Main Results and Contributions of the Thesis

Many results were obtained, correctly described and well analyzed, corresponding to the tasks set, appropriately systematized and richly illustrated with tables and graphs.

The three studied groups had similar demographic data, subjective complaints and studied baseline indicators before the beginning of the applied therapeutic complex.

A reliable improvement on both the 10th and 45th day of the study was achieved in the health status of the patients from the "A" therapeutic group, treated with a physiotherapy program including DO - the indicators of static and dynamic pain and muscle spasm were reduced, the range of motion in the cervical spine improved, the changes in the psycho-emotional state of the patients, as well as their quality of life, were positive. The muscle tone of the paravertebral muscles in the cervical spine, an important clinical sign of functional involvement of the neck, showed a reliable improvement in the group treated with DO not only at the end of the therapeutic course, but also longer lasting on the 45th day in contrast to the effect in the other two groups of patients. A significant increase in neck mobility with time after completion of the therapeutic course, resp. a longer-lasting effect was also observed only in group "A" treated with DO. The established results proved the importance of the DO method combined with TENS and kinesitherapy, applied in therapeutic group "A", comparable to the effectiveness of the method of ultrasound therapy, combined also with TENS and kinesitherapy in group "B", even surpassing it, as well as both methods had better results compared to the "C" group with the administered placebo DO. The proven great therapeutic effectiveness of the low-frequency variable electrostatic field with DO in patients with cervical spondylosis gave Dr. Petrov reason to recommend the application of the physical method of DO in the complex therapy and prevention of these patients.

In the discussion of the obtained results in the thesis, Dr. Yasen Petrov critically compared his own results with those in the contemporary specialized literature, emphasizing their significance, originality and comparability.
In conclusion, the most important results of the study were adequately summarized.
Nine clearly formulated conclusions were synthesized, which accurately reflected the results of the research done and fully met the set goals and objectives.
I accept the theoretical-applied and methodological contributions made by the PhD student himself - for the first time in Bulgaria, a purposeful, in-depth comparative study of the effect of the combined application of DO and physical factors from routine practice in cervical spondylosis has been conducted, proving the therapeutic effectiveness of the combined application of DO, TENS and kinesitherapy through subjective and objective indicators of pain, muscle tone and mobility in the neck, and the applied Zung test to assess the psycho-emotional state and the Neck Disability Index, assessing their quality of life, have proven the better short-term and long-term effect of the therapeutic approach with DO. The PhD student has clearly indicated the contributions of a practical-applied nature for the positive effect of the researched non-invasive treatment approach, including DO and of the developed therapeutic program.
The research design, scientific hypotheses, defined tasks and summaries of the obtained results included in the thesis are original and authentic. The research and written thesis are the doctoral student's own work.
There is a logical and meaningful connection between the individual parts of the thesis.
The style of the thesis is clear, understandable and analytical.

IX. The Abstract is structured in accordance with the requirements, and its content fully corresponds to the dissertation work illustrated with 46 tables and 62 figures.

X. Notes and Recommendations
Single technical and linguistic inaccuracies have been noted, which definitely do not harm the merits of the dissertation.
I recommend to Dr. Petrov to prepare for publication parts of his research in international scientific journals, referenced and indexed in world-renowned databases of scientific information.

XI. Publication Activity
The 3 articles published in connection with the dissertation work meet the quantitative criteria specified in the LASDRB and the internal regulations of the MU - Varna for the publication activity of the PhD student.
The published articles on the subject of the thesis meet the recommended scientometric criteria of the MU - Varna for awarding the scientific "PhD" degree.

XII. Conclusion
Dr. Yasen Todorov Petrov's dissertation is on an important topic for our country, it is elaborated and comprehensive, presents scientific and scientific-applied results and conclusions with an original contribution to science and practice and meets all the requirements of the Law on the Development of the Academic Staff of the Republic of Bulgaria, the Regulations for its implementation and the Regulations of the Medical University of Varna.
The dissertation shows that the PhD student Yasen Todorov Petrov possesses in-depth theoretical

knowledge and professional qualities and skills for independent scientific research.
All the above gives me sufficient reason to confidently give my **positive** assessment of the peer-reviewed thesis work and to suggest to the esteemed members of the scientific jury to give their **positive vote** for awarding Dr. Yasen Todorov Petrov the educational and scientific degree "PhD" in the field of education 7. "Health and sports", professional direction 7.1. "Medicine", scientific specialty "Physiotherapy, Resort therapy and Rehabilitation" at Medical University "Prof. Dr. Paraskev Stoyanov" - Varna.

Заличено на основание чл. 5, §1, б. „В“ от Регламент (ЕС) 2016/679

27.06.2024

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member of the scientific jury