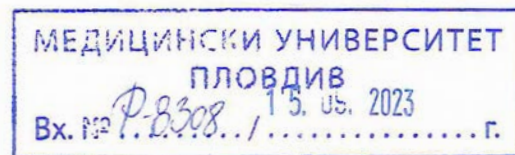


To the attention of:  
The Chairman of the Academic Jury  
Appointed by Order № P – 1995/12.07.2023  
Of the Rector of Medical University, Plovdiv  
15A Vasil Aprilov Blvd.  
4002 Plovdiv

**STATEMENT**



**Regarding a procedure for holding the Academic degree of Doctor of a PhD student on a self-training program in Second Department of Internal Diseases, Faculty of Medicine, Medical University, Plovdiv**

**By Ass. Prof. Dr. Daniel Iliyanov Doykov, MD  
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Faculty of Medicine, Medical University Plovdiv**

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**Topic: Dissertation work of Dr. Nikola Boyanov Boyanov**

**"Evaluation of the work of beginning endoscopists on a high-tech simulator by means of complex stress indices" with academic supervisor Prof. Dr. Vladimir Nikolov Andonov, MD for acquiring the educational and academic degree DOCTOR in Gastroenterology, professional direction 7.1 Medicine, field of higher education, 7. Health and sports**

**Relevance of the topic and appropriateness of the set goals and tasks**

The increasing rate of burn out syndrome among medical professionals is a significant global medico-social problem. The mental stress associated with the medical profession, especially in interventional and surgical majors including Gastroenterology, leads to the production of biologically active substances that increase work capacity and performance but being exposed to them for a longer period leads to pathological reactions (depression, cardiovascular disease, suppression of the immune system, etc.)

The use of non-invasive techniques for measuring the level of stress in students and specialists during training and working with a high-tech simulator is a very good solution to validate the given stress indices and choose the most suitable ones. In addition, it gives the opportunity to compare the reactions and indicators of different people in the same situation which cannot be achieved in real practice.

I believe that the dissertation work is a good start in measuring stress in the medical profession and it would provide a basis for measuring stress in real medical practice along with finding methods for its reduction.

### **General presentation of the procedure and the PhD student**

The presented set of materials, including a dissertation, an abstract of a dissertation and an administrative set of documents complies with the Procedure for acquiring the Academic degree of Doctor at MU - Plovdiv from the Regulations of MU - Plovdiv and it includes all documents listed in the requirements of the Regulations.

The dissertation has a form and volume corresponding to the specific requirements of the department and consists of 118 standard typewritten pages, structured in the following chapters:

Chapter 1: Theoretical-methodological basis of the problem (literature review) - covers 37 pages of the dissertation work;

Chapter 2: Purpose, tasks, materials and methodology - covers 10 pages of the dissertation work;

Chapter 3: Results and Discussion - covers 37 pages of the dissertation work;

Chapter 4: Conclusions - covers 2 pages of the dissertation work.

The bibliography contains a total of 248 titles arranged alphabetically with all sources cited in Vancouver style.

The PhD student has also attached a list of activities related to the dissertation work as follows: 3 full-text publications in scientific periodicals and 2 participations in scientific forums abroad.

### **Brief biographical data of the PhD student**

Dr. Nikola Boyanov Boyanov graduated his higher education from Medical University - Plovdiv where he obtained the educational and qualification degree Master in Medicine. He began his professional career as a doctor specializing in Gastroenterology at MBAL Plovdiv. After acquiring Gastroenterology major in 2014, he joined the team of the Department of Internal Medicine at University Hospital Pulmed and later he held the position of Head of the Department of Gastroenterology at this hospital. He also does a master's degree in "Public Health and Health Management". In 2018, Dr. Nikola Boyanov joined the team of the Medical Simulation Training Center at the Research Institute at MU - Plovdiv where he works as an Assistant.

Dr. Nikola Boyanov is a member of the Bulgarian Medical Union, the Bulgarian Society of Gastroenterology, the Bulgarian Association of Ultrasound in Medicine (BAUM), the National Society of Simulation Medicine and the European Society of Gastrointestinal Endoscopy (ESGE).

The PhD student has participated in many educational and academic courses and initiatives both in the country and abroad. He has numerous publications and congress participations on the topics of interventional endoscopy and simulation training in Gastroenterology which are his main areas of interest. The Medical Simulation Training Center of MU - Plovdiv is actively engaged in training students, interns and gastroenterology specialists in basic and highly specialized activities on live models and virtual reality simulators.

Dr. Boyanov has successfully completed the activities implemented in his individual study plan and the mandatory conditions for obtaining the required number of credits for acquiring the academic degree of Doctor. He successfully passed the doctoral minimum exam. The objectives, tasks and research on the topic of the doctoral course were completed on time.

### **Characteristics and evaluation of the dissertation work**

The dissertation consists of 118 pages, contains 11 chapters and its structure includes: Introduction - 2 pages, Literature review - 37 pages, Aim and Tasks - 1 page, Material and methods - 9 pages, Personal results - 19 pages, Discussion - 16 pages, Conclusion - 1 page, Opinions - 1 page, Abbreviations - 2 pages. The bibliography is extensive and comprises 248 literary sources of which 0 are in

Cyrillic. The dissertation work is very well illustrated and it includes 12 tables and 20 figures.

The topic chosen by the PhD student and his supervisor is clinically relevant and appropriate for a dissertation.

The introduction is presented on a page and a half. It is clearly written and directly presents the problem.

The literature review is 37 pages long. The available data on the subject are presented in detail and analytically. It consists of 3 chapters: Stress – definition and types; Indices for measuring stress; Learning through simulation.

The first chapter examines in detail the nature and types of stress, its cause and the consequences from acute and chronic stress as well as the biochemical mechanisms for these reactions.

The second chapter contains - Indices for measuring stress, both subjective and objective indicators are considered separately. Subjective indicators are stress tests, led by the State Trait Anxiety Inventory (STAI) used in the dissertation work. Cardiac indicators and their changes under stress are very well presented. The salivary biomarkers for which there is already an evidence that they can be used to measure stress are also considered. Also skin electrodermal activity, skin temperature and tri-axial arm movements are discussed as indicators that are examined during the study.

The third chapter is entirely devoted to learning through simulation. The advantages and disadvantages of different types of simulators, tests for its validation and its use for training and qualification acquisition in other countries of the world are presented.

The goal was to assess the stress which the beginning endoscopists endure during training on a virtual simulator and its correlation with their endoscopic skills by means of complex stress indices and the formulated 4 tasks cover the subject of the dissertation work and correctly reflect the problems highlighted in the overview.

The Materials and Methods section presents a full and comprehensive description of the resources and methods used. 65 men were included in the study as gender differences in the studied indicators would create difficulty in their interpretation. The inclusion and exclusion criteria for participation in the study were specified. The devices used are clearly presented - type of simulator (GI-Mentor), type of portable device measuring cardiac parameters, electrodermal activity, skin temperature and

tri-axial arm movements (Empatica 4 Wrist Band) and type of Holter monitor. The experimental protocol was described in detail and could be replicated if needed. The statistical processing of the data was carried out with modern statistical tools using fully relevant analyses.

The results are presented logically and illustrated with 15 figures and 9 tables with original and confirmatory essence. The latter are highly informative and contribute to a detailed presentation of all aspects of the material. The results are combined together with their analysis and interpretation which is appropriate for the interdisciplinary topic of the dissertation work. A portable wristband device is being validated for use in assessing cardiac stress indices by comparing it to a gold standard Holter monitor. Blunt - Altman analysis was used in place to compare two methods which shows a statistically significant correlation between the results. All indicators that the portable device provides for measurement are compared. Sensitivity and specificity for stress measurement of these indicators are determined. Salivary biomarkers were added to the indicators from the portable device. The correlation of each one separately as well as combinations of them with the performance results of the studies individuals were defined. Data on the subjective sense of stress (via STAI) and its correlation with performance were also given. The discussion is focused and competent. PhD student's ability to analyze his own results in the context of data known in the literature is evident. He fully and argumentatively presents the data from his own studies and uses them freely.

### **Contributions and significance of the work for the science and practice**

7 original conclusions are distinguished which coincides with the generally accepted ratio of 2 to 1 concerning the number of tasks. The dissertation work is a genuine contribution to our country because so far there has been no research on stress when working with virtual reality simulators. Even world studies in the field of simulation environment are mainly focused on surgical majors and not on Gastroenterology. There is also little data worldwide on the influence of stress on salivary parameters.

### **Assessment of dissertation publications**

The PhD student presented 3 full-text publications in scientific periodicals and 2 participations in scientific forums abroad. This is enough for a dissertation work for acquiring the academic degree of Doctor.

### **Personal participation of the PhD student**

Dr. Boyanov is the head author of the research. Quite reasonably, due to the complex approach of the research conducted and the data processing, other medical specialists and statisticians were used which does not reduce his contribution but proves his ability to work in a team.

### **Abstract of the dissertation work**

The abstract consists of 36 pages and it clearly reflects the materials and methods of the research, the main results and conclusions of the dissertation work.

### **Critical notes and recommendations**

I recommend that the study should be extended to include more women. To become familiar with the topic of the overview of Cyrillic sources. To create a model for using the obtained data in a real working environment.

### **Personal impressions**

My long-term professional contacts with Dr. Nikola Boyanov as well as my impressions regarding his dissertation work lead to the conclusion that he is an outstanding and dedicated doctor, highly informed not only in gastroenterological topics but in medicine in general, always looking for the latest technologies to patient's interest.

### **CONCLUSION**

The dissertation work presented to me for evaluation shows very well the professional qualities of the PhD student and his ability to conduct scientific research

as well as to make an adequate analysis of the obtained results and to formulate the arising conclusions. It is evident that the current work is the result of the author's personal efforts.

I believe that the presented to me dissertation work “Evaluation of the work of beginning endoscopists on a high-tech simulator by means of complex stress indices” meets the requirements of the Law for Higher Education, the Law on the Development of the Academic Staff in the Republic of Bulgaria and the Regulations for its Application as well as the Regulations of MU - Plovdiv for obtaining the educational and Academic degree Doctor. Considering the positive aspects and the undoubted contributions of the presented dissertation work, I shall give my positive assessment for awarding the educational and Academic degree Doctor to Dr. Nikola Boyanov Boyanov.

12.09.2023

Statement prepared by:

Заличено на основание  
Чл.5 §1, 6. "В" Регламент (ЕС)2016/679

Assoc. Prof. Daniel Doykov, md