REVIEW

By DSc Margarita Angelova Stefanova-Bakracheva, Prof.

Sofia University St. Kliment Ohridski

For awarding the educational and scientific degree “Doctor”

In the scientific area 3.2. Psychology

Doctoral programme Positive Psychology

Author: **Radoslav Dimitrov Shterev**

Title: **The impact of vibro-acoustic stimulation on the psychological resilience of patients with chronic pain**

PhD supervisor: **Prof. Yurii Pavlov Yanakiev, PhD, Paisii Hilendarski University of Plovdiv**

1. General description of the submitted materials

By order № № РД-22-727 as of 21st March 2025 of the Rector of Paisii Hilendarski University of Plovdiv I have been appointed as a member of the scientific jury for providing a procedure for the defense of a dissertation on the topic „The impact of vibro-acoustic stimulation on the psychological resilience of patients with chronic pain“ for awarding the educational and scientific degree “doctor” in the field of higher education 3. Social, economic and legal sciences, professional field, scientific area 3.2. Psychology, doctoral programme: Positive Psychology. Author of the dissertation is Radoslav Dimitrov Shterev– full-time doctoral student at the Department of Psychology with supervisor Prof. Yurii Pavlov Yanakiev, PhD from Paisii Hilendarski University of Plovdiv.

The set of materials, provided by Radoslav Dimitrov Shterev complies to Section 36 (1) of the Rulebook for development of the academic staff of University of Plovdiv and includes the following documents:

- a request to the Rector of the University of Plovdiv for disclosure of the procedure for defense of the dissertation;
- CV;
- protocol from the department council, related to readiness to disclosure of the procedure and preliminary discussion of the dissertation;
- dissertation;
- abstract of the dissertation;
- a list of the articles related to the topic of the dissertation;
- copies of the articles;
- declaration of originality and authenticity of the documents;

2. Brief biographical data about the doctoral student

Radoslav Shterev completed a mathematical high school, a master's degree in economics and a doctoral programme in positive psychology. He has 15 years of experience in training in the use of neuro-rehabilitation equipment in the field of mental health, which is directly related to the topic of his dissertation.

3. Relevance of the topic and appropriateness of the objectives and tasks

Despite decades of studies and evidence on the effects of stress and the influence of the autonomic nervous system and the environment, there is still a lack of connection and effective interaction between neurophysiology, medicine, psychology and psychotherapy to support mental health. To a certain extent, mental health resources are overestimated and preventive measures are lacking, while the negative impact of external stressors on mental health, especially in everyday life, is underestimated and goes unnoticed, while environmental factors, especially given the changes in economic, social and technological aspects in recent years, influence perceived stress and well-being. Radoslav Shterev has very well highlighted the relevance of the interaction between the environment and mental resilience in the contemporary context, which, in particular in professional setting, changes the demands to the cognitive performance of workers. This brings the quality of life, which is outlined as a priority area, into focus. Resilience is placed at the centre of self-regulation in the context of a stress-generating environment and expectation people to be resilient both in occupational and private life without the provision of support. The main drawback - research and sporadic but not systematic and effective training - is also highlighted. The dissertation topic is highly relevant, especially in terms of practical implications.

4. Knowledge of the topic

Radoslav Shterev demonstrates very high skills in content analysis of scientific literature. He has an in-depth knowledge of the state of the art in the areas under study and of contemporary research approaches and practical applications. His presentation of the problem area is concise, conceptually sound and logically structured. Of particular note is the clear description of the complex mechanisms of interacting factors that lead to physiological changes and the accurate illustrative examples that facilitate the reader's understanding of the neurobiological factors involved in resilience. These include brain mediator systems, regulation of stress responses, brain structures and networks, immune response and inflammation, neuroplasticity, genetic and epigenetic factors of resilience with explanation of the response to stress and neural mechanisms that provide reward.

5. Research methods

The problem statement is operationalised in terms of the correct subject and object, formulated aim and objectives of the research. The aim of the dissertation is to develop an apparatus methodology (VAS) and to investigate the potential for positive changes as a result of sustained attentional concentration. The hypotheses are related to the expected positive effects of VAS, in particular of the slow change in the frequency of vibro-stimulation on attentional stability, reduction of perceived pain and level of nervous arousal, and support of resilience. The design and organisation of the study and the methods and scales used in the study are outlined. The recruitment procedure, inclusion and exclusion criteria are described, with a well substantiated design and target population. The instruments employed are correctly presented, i.e. psychophysiological stress test, VAS apparatus, attention stability test, visual analogue scale of experienced pain and latent factors of resilience. The methodology is precise and correct for the tasks and purpose of the study.

6. Characteristics and evaluation of the dissertation

The dissertation research contains 230 pages and is divided into the classical three chapters - theoretical, research design and analysis of results with introduction, conclusion, appendices and bibliography. The sources used are 118, 18 of them Bulgarian, 23 web sources. Most of the studies are post-2000, most of them are from recent years. The text is illustrated with 17 figures and 51 tables.

In Chapter 1, the theoretical framework of the study smoothly introduces the concept of resilience, such as etymology, major theories of its study, conceptualisation as a trait and disposition in a developmental perspective, types, research methods and interventions. It moves on to the neurobiological foundations of resilience, instrumental methods of applied psychophysiology and resilience, and focuses on the object of study – vibro-acoustic stimulation and the effect on resilience. It presents the drive to avoid stressors through ineffective behaviours such as learned helplessness, the negative consequences of experiencing unrecognised and ineffectively managed negative emotions and coping with them, the relationship between resilience and burnout, and motivation in the context of considering the VAS stimulation method as a safe alternative to support the process of adapting and learning constructive models for effective self-regulation. The mechanism of neuroplasticity that enables the construction of resilience and the place of experience and support are described, as are the systematic daily activities that create connections and

opportunities for positive change, including promotion of resilient dispositions. Psychotherapy and pharmacotherapy are addressed in relation to neuroplasticity of the nervous system, cognitive and affective responses, and the effects of different activities (physical) and practices (mindfulness). Biofeedback and neurofeedback are included as methods leading to improved resilience and support of the executive functions and learning of physiological and neurological responses to the encounter. The ecological model and the compensatory model are introduced and the factors of resilience, divided into intrinsic and extrinsic factors, are derived. Resilience is examined as a personality trait and as a developmental resource. The neurobiological basis and mediator systems and stress responses, intervention and prevention guidelines, the place of genetic factors, self-control and volitional attention are outlined in detail. Clearly highlighted are the possibilities of using apparatus methods, biofeedback and neurofeedback as tools for regulating physiological stress responses, transcranial stimulation to enhance emotional regulation and cognitive flexibility and the production of targeted neurotransmitters, audio-visual entrainment to reduce anxiety and provide relaxation, and measurement by an objective indicator - skin conductance. The mechanism of effective action of vibro-acoustic stimulation in its two forms - slowly changing vibration frequency and fixed vibration frequency to increase mental resilience, contributing to mindfulness, attention management and physical relaxation, reducing anxiety and perceived stress, which reduces cognitive overload, are addressed. Possibilities in different practices that influence different aspects of resilience are analysed.

Chapter 2 presents the research design, the research plan, the variables studied, the object and subject, and the sample. The specific target group chosen opens up perspectives for further research in addition to new knowledge. The skin conductance score is used as an objective measure to detect changes, eliminating subjectivity in the evaluation. As a basis for the study, the possibilities of the VAS as an influence on the pattern for five key resilience-related skills are presented - self-reflection and awareness of muscle tension and its relation to anxiety and excessive volitional activation, control of attentional focus gently redirected to a sudden strong sensory stimulus; release of physical tension in the body - by reducing physiological arousal; and the ability to access and maintain positive attitudes.

Chapter 3 systematises the results in relation to the hypotheses put forward. The analysis is correct, taking into account the place of the apparatus method as a passive technique, and Radoslav Shterev accurately highlights the advantages and limitations of using VAS without over-interpretation. Personal contributions are presented in the piloted author

programme to consider the specificity of controlled changes in stimulation frequency to support resilience. Controlled changes in vibro-stimulation frequency are reported to positively influence attentional stability as an indirect indicator of resilience, perceptions of experienced cognitive and physical stress, reduce nervous system arousal, and promote latent resilience factors social cohesion, adaptability, emotional recovery, and behavioural resilience with short-term effects on response patterns and recovery after stressful situations.

The study is a comprehensive systematic review that considers resilience as a dynamic construct of interrelated factors that can be both a risk and a resource. This clearly stated position of Radoslav Shterev has very important practical applications. Resilience is presented as an interaction and understood as a personality trait and developmental resource, including through the dynamics of individual development. A particular focus is on conceptualising the effectiveness and usefulness of resilience as an approach in the helping professions and as a capacity that can be built. Very impressive is the depth of knowledge and research on the topic and the thorough and coherent presentation.

7. Contributions and significance of the dissertation for science and practice

I accept the contributions of Radoslav Shterev in three groups - theoretical, methodological and applied. A multidisciplinary approach to the study of resilience, a combined measurement methodology with objective assessment indicators, and two instrumental methods for assessing and supporting mental resilience have been presented and validated. All of this has implications for training, research and practice in a variety of organisational settings, centres, schools and across the broad spectrum of individual support. Shcherev cites findings of reductions in physiological performance on challenging tasks, complex tasks and reaction times, including the Stroop test in relation to voluntary attention. Energy expenditure is particularly important given that information processing is related to daily work, information noise, multitasking and the relationship between the volitional resources used, differentiated into informational, physical, behavioural and affective. I would add that an important contribution is the possibility to distinguish between preventive and interventional practices. To the extent that interventions require specialised support, preventive application has quite different potential to limit energy resource depletion. The clearly derived physiological model of relationships and effective interaction in relation to learning relates to a current environmental problem and should be promoted given the many opportunities for preventive and proactive application in practice. In this respect, the use of VAS for preventive purposes, as well as the research directions

outlined by Radoslav Shterev, are extremely timely and can be seen as a potential for building personal competence.

8. Evaluation of the publications related to the dissertation

Radoslav Shterev has submitted 4 publications related to the topic of the dissertation research, all published in the period 2016-2024. Two of the publications are self-authored, two are co-authored. One of the publications is a study and three are articles. One of the publications is in a WoS-indexed journal. Two of the publications are in journals, one in a Yearbook and one in Conference Proceedings.

9. Personal contribution of the doctoral student

I believe that the obtained results and the formulated contributions are personal work of the doctoral student.

10. Abstract of the dissertation

The dissertation abstract comprises 32 pages and meets the requirements; it describes the main results and the contents of the dissertation research.

11. Critical remarks and recommendations

I have some technical notes to improve the work for future use, which in no way detract from its merits. It would be good to put more emphasis on the author's programme and positive changes even in short-term implementation. The answer to the research question posed is not sufficiently clear as to what criteria the designer of programmes for the VAS needs to follow in order to effectively influence resilience. The rationale for the choice of number and duration of sessions would benefit from further elaboration, especially in light of the described findings focusing on the need for lasting effects. The subject and object are described differently in the abstract and the thesis, as are the research questions. In practice, these (as formulated in the dissertation) represent the individual tasks and are directly linked to the hypotheses put forward. Much emphasis is placed on the individual author (e.g. Piryova), self-citation can be avoided. It is not clear why regression rather than analysis of variance was used for the age effect. In Chapter 3 the results could be derived and described by hypotheses, rather than in two paragraphs, Results and Analysis.

12. Personal impressions

My personal impressions are based on the materials presented for review. They allow me to conclude that Radoslav Shterev is has own vision, very broad culture and research competence. Moreover, I know Radoslav Shterev as an experienced and competent trainer in the field of the dissertation.

13. Recommendations for future use of the dissertation contributions and results

The directions for future research are clearly outlined and I would add the possibility of short term certification training for both prevention and intervention. I recommend the dissertation to be published and promoted because of its undeniable merits for students and practitioners. The results of the study can also be included as topics in various courses and as a stand-alone course in undergraduate and postgraduate curricula.

CONCLUSION

The dissertation contains scientific and applicable results, which represent an original contribution to science and meet all the requirements of the Law for Development of Academic Staff in the Republic of Bulgaria and the respective Regulations of Paisii Hilendarski University of Plovdiv.

The dissertation research undoubtedly demonstrates that Radoslav Shterev possesses in-depth theoretical knowledge and professional skills to independently conduct scientific research in the scientific specialty 3.2. Psychology.

Due to the abovementioned advantages, I give my positive assessment of the research presented by the reviewed dissertation, abstract, results and contributions, and I propose the scientific jury to award Radoslav Dimitrov Shterev the educational and scientific degree ‘Doctor’ in the professional field 3.2. Psychology, doctoral programme: Positive Psychology.

23rd April 2025

Reviewer:

Prof. Margarita Bakracheva, DSc