PRZEMIANY W NOWOCZESNYM SPOŁECZEŃSTWIE: ASPEKTY SPOŁECZNE

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Monograph

TRANSFORMATIONS IN CONTEMPORARY SOCIETY: SOCIAL ASPECTS

*Edited by Tetyana Nestorenko
Sławomir Śliwa*

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Authors are responsible for content of the materials.

prawidłowego funkcjonowania sprawności fizycznej człowieka i jego sił witalnych".[93] Młodzi, uzdolnieni ludzie rozwijają swój talent pod opieką trenera. „Kompetencje trenera obejmują (...) umiejętności w rozpoznawaniu predyspozycji, rozwój uzdolnień (...), planowanie i realizowanie zracjonalizowanego i zindywidualizowanego planu z celami, zadaniami."[94] Inną ważną kwestią w podejmowanym temacie, jest wspieranie rozwoju uzdolnień sportowych. To powinno być zadanie instytucji publicznych. Z roku na rok przeznacza się na sport coraz więcej funduszy, a „w kontekście wykorzystania narzędzi marketingu sportowego należy rozważyć, w jakim stopniu cele, zasady (...), wpisują się w system funkcjonowania władz regionu."[95]

 Instytucje państwowe coraz częściej lokują sport w swoich strategiach promocji. „Marketing terytorialny, zwany sztuką sprzedawania miejsc, koncentruje się na materialnych i niematerialnych walorach regionu takich jak ; infrastruktura, atrakcje, jakość życia, a także turystyka, rekreacja i sport."[96] Sport zawsze przyciągał kibiców – mieszkańców regionu. Dobrze zorganizowane imprezy sportowe, ich popularność, medialność często mają przełożenie w ocenie działalności władz przez społeczność lokalną. Dlatego też należy dążyć do takich sytuacji, by aktywność fizyczna młodzieży była widoczna w regionie, by stała się jego „żywą reklamą" i wpływała na dynamiczny rozwój regionu.

5.2. Application possibilities of mathematical methods for the diagnosis of cardiovascular diseases in order to preserve health and healthy lifestyles

 Public health is a major factor in social life of the community, the basis of his progress, the economy, welfare, happiness and well-being. The rate of development of modern society are placing ever greater demands on the state of health, human efficiency and endurance. During the last decade witnessed the emergence of new factors affecting the health and lifestyle. This is due to the increasing complexity of social life, economic and environmental risks, impacts and enhancement of stress on the body loads which is manifested by various disorders of the cardiovascular system. The mortality rate is still high in the last 10 years and the rate of its decline insufficient despite the decline in total mortality from cardiovascular disease. In improving the prognosis of life of patients with cardiovascular disease the modern methods and technologies of diagnosis and treatment of these diseases play a major role.

 Mathematical methods and models built with the help of them are used in almost of all areas of human activity to describe the various processes and phenomena. In

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[93] www.nebkt.pl z dn. 10.12.2015 roku.
[94] Tamże, s. 28.
[95] Tamże, s. 80.
[96] Tamże, s. 81.

medicine the methods of probability theory, mathematical statistics, the theory of sets are widely used to determine the degree of reliability, accumulation, systematization and structuring of clinical, biomedical, laboratory tests. It allow to us propose and test different hypotheses about the relationship of the studied phenomena and to bring them in formalized form.

The developed mathematical models have a positive impact on the prediction and prevention of diseases in general cardiology, that determines the relevance of this work.

Cardiology is the field of medicine, which is particularly valuable knowledge and experience of the physician, has accumulated a large number of diverse, sometimes contradictory information. Applied mathematics apparatus in it can be divided into two areas: [1]

1) methods of mathematical modelling of cardiac activity describing the physiological processes in the myocardium. These include: the mathematical model of the electric field of the heart, blood pressure regulation, models describing the movement of blood through the vessels, models of the circulatory system, modelling of cardiac arrhythmias and other investigations;

2) mathematical methods of analysing the characteristics of cardiac activity in order to determine the functional state of the heart and prediction of possible diseases, but not containing information about the mechanisms of the cardiovascular system at the same time.

An example of the first direction is described in the [2] as the complex mathematical model of the human cardiovascular system, created by combining the one-dimensional model of the arterial system, blood circulation model and model of long-term effects of the regulation of the heart and kidneys. The combination of these models implemented as software modules allowed to create agent-based graphic models in the form of modular diagrams consisting of interconnected blocks (modules), and carry out numerical calculations.

The effectiveness of a particular model is determined through objectivity in reflection the principles of functioning of biological objects and dependency the characteristics of models of biological objects on the model parameters values.

It should be noted that most research involves the creation of both a mathematical model and the application of mathematical methods for the purpose of statistical data processing and forecasting. In the development of mathematical methods for diseases and based on these predictions the statistical analysis and intellectual methods are widely used in recent decades.

Due to the need to consider the set of diagnostic features, multivariate statistical methods, such as: variance, discriminate, regression, factor and cluster analysis received great popularity. It will be described in the following sources.

With the help of logistic regression, the authors in the [3] describe the prognostic value of modifiable and non-modifiable risk factors of cardiovascular diseases for the formation of labile arterial hypertension (LAH) in adolescents. Conducting a comprehensive analysis of the risk factors in adolescents with labile hypertension allowed to identify the most important from them for clinical practice. The development and manifestation of the LAH with the probability of a stable hypertension formation in the future are the result of the complex impact of environmental factors that have a negative influence on their background of unfavourable heredity. In the [4] the mathematical linear and non-linear regression models of cardiovascular diagnostics are constructed, these models include individual features of the particular patient and the results of its surveys. In the formation of such models different types of data are used. It was revealed that non-linear diagnostic model have the most accuracy.

Using the method of binary regression the authors in the [5] evaluated the significance of heart rate in patients with acute coronary syndrome as a factor in cardiovascular mortality risk. Parameters such as: the presence of myocardial infarction, heart rate on admission, the mean heart rate at hospital, at extraction or at death, the difference between them, as well as the experience of coronary heart disease (CHD) were evaluated from the point of view of importance for the patient's survival by clustering on heart rate. Each cluster is determined by the marginal effect on mortality influence. Uni- and multivariate logistic regression analysis were used in the [6] to study the relationship of multiple risk factors with coronary heart disease. Patients were divided into four groups depending on the presence of the induced physical chest pain and ST-segment inhibition, and according to gender. Results of the analysis by logistic regression showed that inhibition of ST-segment together with the induced physical pain are the most important factors in the diagnosis of coronary heart disease. The research [7] provides a method for the classification of medical blood pressure signal for the development of the degree of hypotension risk, based on the construction of the linear regression model for the blood pressure parameters, followed by the use of the classifier according to the method of support vectors. Here studied the time series of patients in intensive care with risk threatening hypotension on a background of severe underlying disease. For training of the classifier 4-dimensional vector characteristics of the blood pressure was calculated, the coordinates of which are the coefficients of the linear regression of systolic, diastolic and pulse pressure. The models, which used the regression of systolic or diastolic blood pressure by pulse pressure shows the best quality for the classification of medical signals of arterial pressure according to the risk degree of hypotension compared with the regression of systolic pressure by diastolic.

The aim of the study [8] is the use of a binary regression to identify new prognostic markers of distant poor prognosis of mortality and cardiovascular events in chronic heart failure. The study was conducted for 150 patients with chronic heart failure. Their clinical status was assessed, a 6-minute walk test ECG and ehocardiography were held. By the method of binary logistic regression the probability of occurrence of the event was calculated, depending on the combination of features that had demonstrated the highest level of importance. Mortality of patients and their adverse cardiovascular events, most depend on the following factors individually: smoking, blood haemoglobin, the value of the 6-minute walk test, myocardial infarction and arterial fibrillation.

The purpose of [9] is to study the structure of relationships in normal and pathological indicators such as heart rate, systolic and diastolic blood pressure, total peripheral vascular resistance. With the help of digital models of dynamic systems the symbolic graphs and, on their basis, reflecting idealized cycles in the changes of studied parameters were built for the control group of healthy subjects and groups with the pathology of the cardiovascular system. The results show significant differences of contours which enhance and weaken deviation in the symbolic graphs describing the structure of the relations of cardiovascular parameters in health and in disease, which determines the nature of their role in the dynamics and adaptive mechanisms of the human body.

The work [10] is devoted to the creation of a mathematical model of the aggregate assessment of electro-physiological parameters of the person taking into account his individual norm by using factor analysis. The objective is to develop a method of assessing the aggregate the electro-physiological parameters based on individual standards. The parameters make the individual matrix that is used to obtain factor structure, typical for a given patient. Based on it, the system of boundary factor values was built. Further, after any external influence the ECG was recorded with calculation of factor values based on the matrix of weight loads of the initial statement. The change was considered as significant if the values of factors go beyond the norm formed individual. With this method of assessment is possible to follow the dynamics of the state, determining the degree of deviation factors and the speed deviation with an increase in change.

In the [11] the author uses correlation analysis method for prediction of arterial fibrillation (AF), depending on the duration of arterial hypertension (AH). The study included patients with hypertension I, II stage. All patients underwent bicycle exercise study and long-term monitoring of ECG Halter. According to the correlation analysis between the AG experience and the presence of AF significant positive relationship was received. It was revealed that the risk of developing arterial fibrillation increases 2.3 times with increasing AG seniority for more than 10 years.

To evaluate the existence and changing of the form of cardiovascular disease the authors in the [12] used several methods. By using the method of main component the original feature space was reduced to 16 components. Algorithms of cardiovascular diagnosis are based on the use of the Fisher discriminate analysis. Individual model of future changes in the cardiovascular system is also developed using the confidence coefficient, which takes into account the frequency and the behaviour of the values of the patient's symptoms over time, which allowed to obtain the individual prognosis of existence and change the form of disease in a patient at the proximal periods.

To solve the problem of diagnosis Bayesian method is widely used. It allows to calculate the probability of disease on the basis of the available prior probabilities of disease and given conditional probabilities of symptoms for the patient. Bayes' formula serves as basis of diagnostic procedure that uses a Wald method of sequential statistical data analysis. By the Wald method after determining any sign there is an attempt to establish the diagnosis by this sign.

In the [13] to determine the probability of the impact of signs of rhythm violations and the heart conduction on the occurrence of arrhythmias and cardiac conduction the sequential analysis of Wald and Bayes' theorem are applied. Among patients 77 prognostic signs of arrhythmias and cardiac conduction were identified, including 58 and 19 risk factors – factors of antirisk. Among the identified risk factors, along with biological and natural, a significant place is occupied by the risk factors of socio – cultural: an unhealthy lifestyle, physical and neurological overstraining, conflicts, smoking, alcohol abuse, lack of exercise, irregular medical check-up, etc.

Wald and Bayesian methods in combination have a number of advantages. Built on their principles the predictive system can be used not only for the identification of risk factors, but also as a scale for assessing the risk of the total risk of action. Unlimited number of factors may be used in the system designing: the larger the factors used in the system, the more reliable prognosis. The difficulty in applying Bayes' method in the diagnosis is that the a priori probability and the conditional probabilities of the disease symptoms are often not known. In this case, the use of Bayesian strategy is impossible, and classical and derivatives decision criteria are used.

In systems based solely on mathematical statistics methods, diagnostic results are displayed on the basis of mathematical operations that can be radically different from the usual action and logic a doctor. In this regard, there is a problem in explaining the received solutions in the case of using these methods in expert systems of diagnosis and prognosis.

In the problems of diagnosis and prognosis appropriate to use intellectual methods. These include: a neural network; fuzzy logic methods, nearest neighbour method, genetic algorithms, logic and probabilistic approaches.

The main advantages of neural computing are as high adaptive pattern recognition algorithms. Studies such [14] with the use of artificial neural networks are aimed at predicting the acute coronary syndrome outcomes. The developed software package for predicting the outcomes of acute of transmural myocardial infarction uses fully connected multilayer neural network that would greatly improve the accuracy and efficiency of diagnosis and prognosis of acute myocardial infarction, as well as shorten the selection of therapeutic measures.

The aim of the work [15] is the use of autoregressive analysis, fuzzy sets, non-linear dynamics and neurocomputing to predict arterial fibrillation outcomes by creating of learning bioengineering system providing individual and objective forecast. The objectives are solved with use the main provisions of pattern recognition theory, fuzzy set theory, control theory, biotechnology and medical systems, theory of probability and mathematical statistics, methods of modelling and optimization techniques for recording and analysis of electrophysiologic data including variation pulsometry, information and conditional probability analysis. The work identified informative quantitative characteristics prediction of arterial fibrillation outcomes.

The aim of study [16] is the creation of methods and algorithms for two-agent classification based on morphological analysis and probabilistic neural networks, providing the quality of decision-making on the cardiovascular system diagnostic. To solve the problems the following methods were used: the system, the spectral, morphological analysis, mathematical statistics, fuzzy neural networks, pattern recognition, expert evaluation and decision-making. The author developed the structural and functional schemes of classification of multi-agent systems, including probabilistic neural network with grouping of informative features by macro layers, allowing the use of knowledge from the database; as well as the technology of training samples formation and training of the probabilistic neural network with macro layers close to the grouping of informative features on macro layers.

Thus the application of mathematical methods allows structuring and processing a large number of different types of quantitative and qualitative medical information in order to identify patterns and relationships between parameters characterizing the state of the heart and formation of a single formal description of the relationship between them. Their introduction to modern technology is designed to improve the forecasting, early diagnosis of various cardiac diseases, which will contribute to the development of preventive measures to promote physical health, improve the quality of life in today's constantly changing environment.

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Part 5. The role of healthy stile of life in the transformation of society

5.1.   Filip Pokusa. Strategy for the organization of sports events.
The article presents the stages of model management scheme in the institution, which is responsible for project related to the organization of the sporting event. Each sports event requires that a range of actions, both at the stage of preparation, and after the event. Each sports event is a unique project, hence any organizer of a sporting event should start with the preparation of the strategy, which by definition should include the best methods of operation and effective use of all available resources.

5.2.   Elena Vysotskaya, Tatiana Kocharova, Andrii Porvan. Application possibilities of mathematical methods for the diagnosis of cardiovascular diseases in order to preserve health and healthy lifestyles.
This work is considering the question of the application of mathematical methods in cardiology in order to provide of operational problem solving of diagnosis and treatment patients with diseases of the cardiovascular system due to influence of the various psycho-emotional, man-made, social and economic factors that contribute to the preservation of physical health and promoting healthy lifestyles.

5.3.   Lilya Hirnyak. The importance of quality nutrition for a healthy lifestyle.
The basic principles of preventive nutrition people under the influence of adverse environmental factors have been discussed at the article. Also the negative impact of synthetic food additives on the state of the human body provided the consumption of foods containing these additives has been highlighted. The author proposed to develop a better food system adapting to the adapted to the peculiarities of Ukraine, focusing on the organization of preventive nutrition.

5.4.   Olga Gnatiuk. Features of the primary school pupils training valeology in terms of society transformation.
The article highlights features of the primary school pupils training valeology in terms of education transformation. Presented the basic directions of the system of valeology training. Practical advice is given to teachers for the improvement of school valeological work.

5.5.   Olena Kuznetsova, Bogdan Zubrytskyi, Yuri Kosobutskyy, Petro Sholopak. Forming and development of health-preserving competence of future specialists is in educational space of institute of higher.
One of the most pressing questions of modern education – forming of competent attitude toward the students' health is considered in the article. A purpose of national community from a maintenance and development of young people's health, providing of their personal safety are set, according to normative documents. A value, essence and basic parameters of health – preserving competence is reflected. Two constituents in health – preserving competence forming and development process are indicated.

5.6.   Khrystyna Libovych, Romana Sirenro, Oksana Shukatka. Socio-psychological adaptation of students to study at higher educational institutions.
The article describes the problem of socio-psychological adaptation of first-year students to study at higher educational institutions. The basic theoretical and methodological principles of adaptation were defined. Structural components and functional mechanisms of adaptation process to the conditions of study and their dependence on basic individual traits of students were investigated.

5.7.   Yaroslava Logvinova. Formation of environmental responsibility means students of tourism.
The meaning of tourist students' activity in forming of a responsible attitude to nature in reviewed in the article. Approaches towards ecological problems solution are highlighted. The idea as for the source of ecological troubles in the anthropocentric attitude to the environment is expressed. Tourism functions (recreational, social, cultural, ecological, economic and educational) and tourism types are examined. The influence of ecological behavior on the person's responsibility sphere is reviewed.

4.4. **Voyedilova Olena** – PhD in Pedagogical Sciences, Associate Professor,
T. G. Shevchenko Chernihiv National Pedagogical University, Chernihiv, Ukraine

4.5. **Yurii Dolinnij** – PhD in Pedagogical Sciences, Associate Professor,
Donbass State Engineering Academy, Kramatorsk, Ukraine

4.6. **Yuliya Komarcheva** – student,
Donbass State Pedagogical University, Slovyansk, Ukraine,
Iryna Ostopolets – PhD in Psychology, Associate Professor,
Donbass State Pedagogical University, Slovyansk, Ukraine

4.7. **Olena Markova** – PhD in Pedagogical Sciences, Associate Professor,
Kirovohrad State Pedagogical University named after Volodymyr Vynnychenko,
Kropyvnytsky, Ukraine

4.8. **Anastasiia Melnik** – PhD in Pedagogical Sciences,
Kirovohrad State Pedagogical University named after Volodymyr Vynnychenko,
Kropyvnytsky, Ukraine

4.9. **Oleh Olijnyk** – Associate Professor,
Donbass State Engineering Academy, Kramatorsk, Ukraine,
Yurii Sorokin – Senior Lecturer,
Donbass State Engineering Academy, Kramatorsk, Ukraine,
Yurii Dolinnij – PhD in Pedagogical Sciences, Associate Professor,
Donbass State Engineering Academy, Kramatorsk, Ukraine

4.10. **Oleksii Stasenko** – PhD in Pedagogical Sciences,
Kirovohrad State Pedagogical University named after Volodymyr Vynnychenko,
Kropyvnytsky, Ukraine

4.11. **Irina Sundukova** – Kirovohrad State Pedagogical University named after Volodymyr
Vynnychenko, Kropyvnytsky, Ukraine

4.12. **Olga Shevchenko** – PhD in Pedagogical Sciences, Associate Professor,
Kirovohrad State Pedagogical University named after Volodymyr Vynnychenko,
Kropyvnytsky, Ukraine

4.13. **Nataliia Shcherbatiuk** – Kirovohrad State Pedagogical University named after
Volodymyr Vynnychenko, Kropyvnytsky, Ukraine

Part 5 The role of healthy stile of life in the transformation of society

5.1. **Filip Pokusa** – Msc,
The Academy of Management and Administration in Opole, Republic of Poland

5.2. **Elena Vysotskaya** – Doctor of Technical Science, Professor,
Kharkiv National University of Radio Electronics, Kharkiv, Ukraine,
Tatiana Kocharova – Kharkiv National Medical University, Kharkiv, Ukraine,
Andrii Porvan – PhD in Technical Sciences, Associate Professor,
Kharkiv National University of Radio Electronics, Kharkiv, Ukraine

5.3. **Lilya Hirnyak** – PhD in Technical Sciences, Associate Professor,
Lviv University of Trade and Economics, Lviv, Ukraine