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TABLE OF CONTENTS

DRUGS' IMPACT ON NIGHT AWAKENING AMONG PATIENTS WITH SLEEP APNEA

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Abstract:

Sleep apnea means stop breathing in an involuntary way during sleep. It is caused by stimulants among others: alcohol, caffeine or nicotine. They may cause night awakenings. The aim of this research was the issue - how the stimulants affect night awakenings in people with sleep apnea or symptoms which indicate of the need for diagnosis in its direction. In this study 103 patients hospitalized in the area of Śląskie Voivodeship were investigated. Methods used in the work were author's research survey and analysis of data from the history of patients' diseases. Stimulants: drinking beer (46.9%), real coffee (44%), smoking (34.6%) were linked with nocturnal awakenings. It was estimated that drinking alcohol (especially beer at least once a week), drinking coffee (real, drinking up to 1 coffee per day), smoking (up to 10 pieces per day, nicotine addiction up to 15 years) was related to the occurrence of awakenings at night among people with sleep apnea or with symptoms which indicate it.

Keywords:

stimulants, fragmentary dream, sleep apnea

Introduction

Sleep apnea

Sleep apnea means stop breathing in an involuntary way during sleep. In Greek, the word "apnea" means the literal translation of "no breath".

In relation to epidemiology, it can be said that sleep apnea is caused by many factors. They are:

• male gender - it is observed more often in men than in women, and this relationship mainly affects African American and Hispanic men and living in the Pacific Islands;

• excessive body weight;

• age over 40 years;

• sleeping on the back;

• small upper respiratory tract;

• large tongue, tonsils or tongue;

• chin depression;

• small jaw;

• big bite;

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- large neck circumference - understood as a circumference: ≥ 43 cm in a man or ≥ 41 cm in a woman;
- smoking tobacco;
- alcohol consumption;
- excessive consumption of coffee.

Unfortunately, sleep apnea can occur at any age and affect even children [1, 2, 3]. The genetic basis for the occurrence of sleep apnea is also suggested, however, the theory this requires scientific confirmation [2]. Factors conducive to the occurrence of sleep disorders are also socio-economic factors as well as psychological factors that existed in childhood. Among them can be mentioned: poverty, experiencing physical violence, a sense of hopelessness [4]. A shift factor that completely disturbs the circadian rhythm is a considerable factor [5, 6].

Kinds of sleep apnea

Types of sleep apnea are presented in Fig. 1. Of these, obstructive sleep apnea is diagnosed most frequently. Each apnea variant has a slightly different etiology, but in all types of pathophysiological pathology, untreated patients stop breathing during sleep, which occurs many times and can last for 60 seconds or even longer. Importantly, there is no full recovery, so that the patient is very often unaware that he stops breathing.
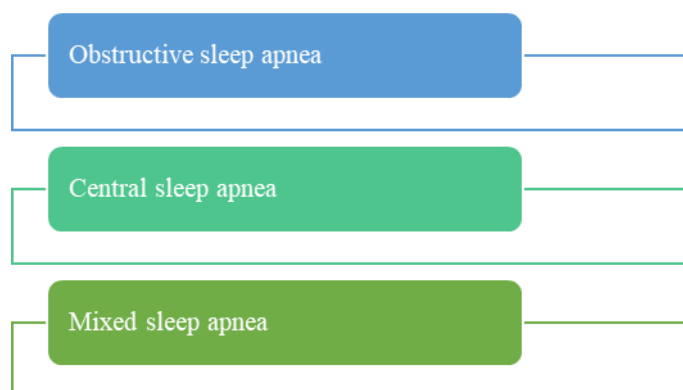
Fig. 1. Varieties of sleep apnea
Source: own elaboration

The first type of apnea, which is obstructive sleep apnea, is characterized by the existence of an obstacle in the airways, which results in the inability of proper air flow through them. Most often the soft tissue located in the back of the throat collapses and closes the air supply during sleep. The exact pathomechanism lies in the fact that the tongue falls on the soft palate, and it along with the tongue fall off on the back of the throat, which induces airway obstruction. It is suspected that the mechanical disorders in question have a neurological background, thus the flaccidity of the tongue's muscles and throat comes from abnormal brain signaling [1, 2, 3].

In the second type of apnea, i.e. central sleep apnea, the airways remain unobstructed, but there is a disturbed signaling on the brain-muscle pathway and breathing does not occur.

In turn, the third and the last type of apnea is a mix of the first two types. The sleep of a person affected by this type of aphasia is characterized by numerous night demolitions and bad quality.

During each sleep apnea, the brain signals to the sleeper, however exclusively in a particular body, that he should resume breathing [1, 3].

Clinical implications of nocturnal awakenings

The effects of poor sleep hygiene can include:
- it is difficult to recall memory;
- increasing the level of stress;
- neuronal dysfunction;
- changes in behavior;
- low capacity of the organism;
- trouble concentrating and focusing attention;
- problems with memorizing;
- weakened long-term memory, working memory;
- disturbed executive functions of a higher order;
- difficult decision-making processes;
- slurred speech;
- weakened immune response to vaccination;
- high blood pressure;
- easy weight gain;
- impotence;
- headaches;
- generalized malaise;
- low oxygen concentration in the blood;
- bed wetting [1, 3, 7, 8, 9].

The aforementioned clinical consequences may in fact affect the increased risk of causing a traffic accident or other dangerous events that may result in health and life threatening their own lives and others, and may result in inability to work or disability [1, 7].

Prevention of sleep apnea

In order to reduce the risk of OSA (*Obstructive Sleep Apnea*), certain steps should be taken regarding the broadly defined lifestyle, i.e. eating habits, the use of stimulants, or physical activity.

The main guidelines on the prevention of obstructive sleep apnea are presented in Fig. 2.

Fig. 2. Main preventive goals of obstructive sleep apnea
Source: own elaboration

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Weight reduction. This is the first-line prophylactic treatment, the most important goal. Weight loss supports CPAP (treatment.

Avoidance of alcohol. Consumption of alcohol induces frequent night awakening and causes relaxation of the respiratory muscles of the upper respiratory tract.

Stop smoking. Cigarette smoking causes swelling of the upper respiratory tract, which has a negative effect on apnea and increases snoring.

Sleeping on the sides. Lying on the back can increase the probability of breathing disorders during sleep [3].

Aim

The aim of this research was the issue - how the stimulants (alcohol - type and frequency of consumption, coffee – type and the number of drinks consumed daily and cigarettes - the number of cigarettes smoked per day along with the length of nicotine addiction) affect night awakenings in people with sleep apnea or symptoms indicative of the need for diagnosis in its direction.

Material and Methods

Material
The study was a full population study. The total population was 103 patients:
• Department of Lung Diseases in Bytom;
• Pneumonological Department in Katowice;
• Pulmonological Department in Tarnowskie Góry;
• Otolaryngological Ward in Tarnowskie Góry;
There were 34 women and 69 men in the study group, which was 33% and 67% of respondents. The mean age of the surveyed women was 58.5 years, while in men it was 57 years.
The criteria for inclusion in the study were:
• consent to participation in the research, use of data and consent to their processing, in accordance with the information sheet;
• diagnosed obstructive sleep apnea or diagnosis towards him;
• the ability to complete the survey form yourself.
The exclusion criteria were:
• a condition that makes it impossible to fill in the questionnaire by yourself - life threatening states, unconsciousness, medium or deep dementia, intellectual disability;
• no diagnosed obstructive sleep apnea or no diagnosis in its direction.

Methods
The research methods used in the work were:
• author's research survey;
• analysis of data from the history of patients' diseases.

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Before the start of the study, the research questionnaire was validated by conducting 15 questionnaires checking the correctness, validity, construction, way of formulating questions contained in the questionnaire form.

The questionnaire form consisted of two parts: recordable questions and proper questions.

In the score sheet the patient was asked to provide: sex, age [in years], education, place of residence, marital status, number of children, where he lives, social status, material status, current body weight [kg] and current height [cm]. The proper part included questions about stimulants (alcohol - type and frequency of consumption, coffee – type and the number of drinks consumed daily and cigarettes - the number of cigarettes smoked per day along with the length of nicotine addiction) and also about night awakenings among patients with sleep apnea or with symptoms which are indicating it.

The approval of Hospital Directors was obtained for conducting the study. The study was carried out in April and May 2019.

Statistical analysis

The collected data was ordered and analyzed in Microsoft Excel 2016. In the next stage, the aggregated data was subjected to statistical analysis in the Dell Inc. program. (2016). Dell Statistica (data analysis software system), version 13. software.dell.com.

For statistical analysis of the frequency of selected statistical features

and determining the dependence or correlation between the given statistical features

in the general population of women and men with obstructive sleep apnea

or symptoms suggestive of conducting diagnostics in its direction, respectively, categorical tables were used to assess the relationship between qualitative statistical characteristics, based on which categorized histograms were created.

Results

As part of the study of patients with sleep apnea or its symptoms, the effects of stimulants (alcohol, coffee and cigarettes) on nocturnal awakenings were investigated.

As many as 63% of patients with sleep apnea or symptoms suggestive of it, who wake up at night, admitted to drinking alcohol – Fig. 3.

Fig. 3. Alcohol consumption and night awakening
Source: own calculations

Patients with sleep apnea or its symptoms were also asked about the type of alcohol consumed and the frequency of its consumption.

Almost half of the patients who consume beer reported night wake up (46.9%) – Fig. 4.
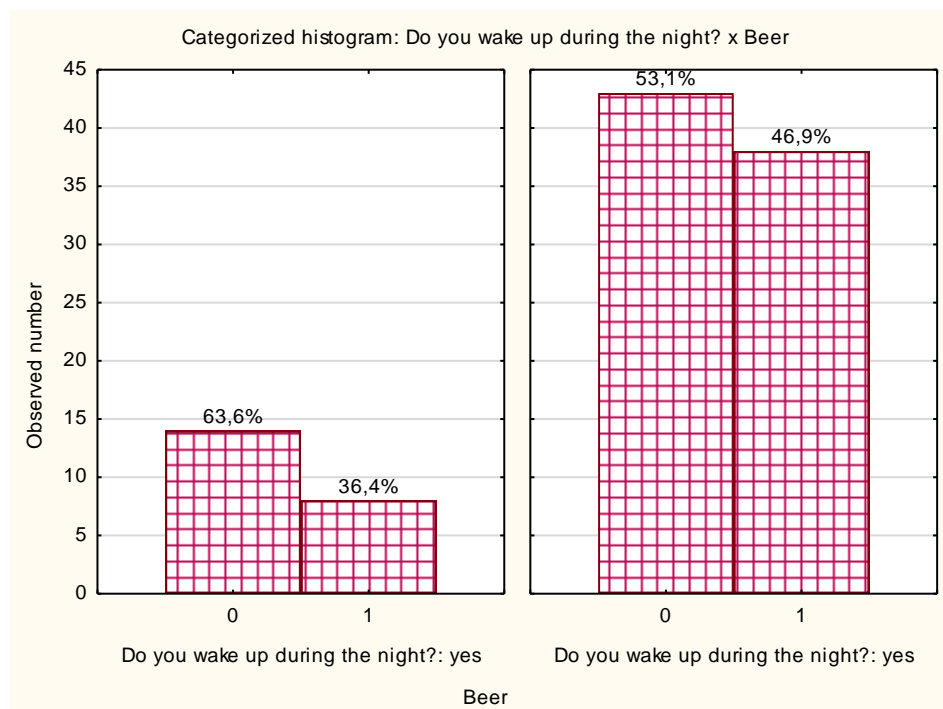
Fig. 4. The impact of beer consumption on the occurrence of awakenings at night among patients with sleep apnea or with symptoms which are indicating it
Source: own calculations

In terms of the frequency of beer consumption, the highest percentage of people awakening in the night included patients consuming beer once a week or 2 times more per week (17.5% and 15% respectively) – Fig. 5.

Categorized histogram: Do you wake up during the night? x Frequency of beer consumption
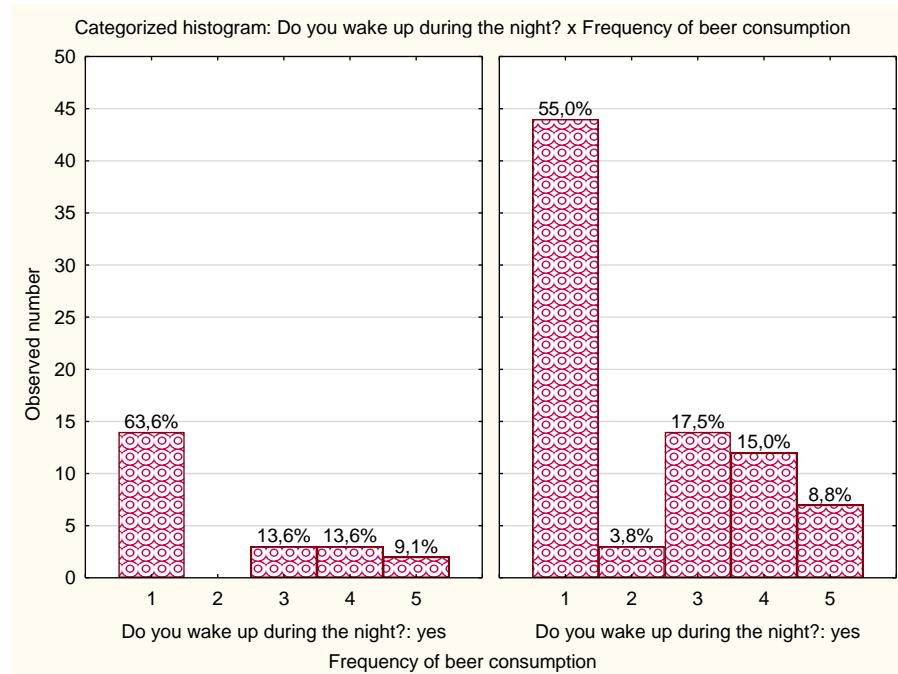
Fig. 5. Frequency of beer consumption and night wake up
Source: own calculations
Legend:
1 – does not drink
2 – once a month
3 – once a week
4 – twice or more in week
5 – daily

Another stimulant that was evaluated was coffee - specifically its type and the number of coffees drunk on a daily basis [n].

As noted, real coffee contributed the most for night wake up (44.4%), while among people who drink cappuccino - there were no wakes – Fig. 6.
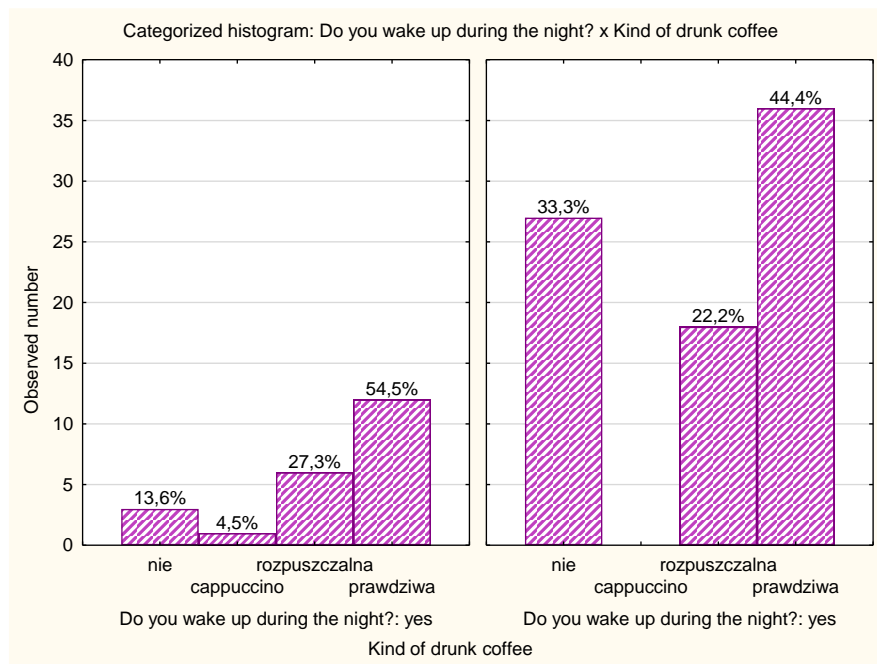
Fig. 6. Type of coffee being drunk and night wake up
Source: own calculations
Legend:
1 – no
2 – cappuccino
3 – soluble coffee
4 – real coffee

As it turned out, more than half of people with sleep apnea or symptoms indicating it, who reported night awakening, drank at most one coffee a day (54.3%). The consumption of 2-3 coffees among these patients was associated with the occurrence of arousals at almost 40% (39.5%), while> 3 coffees per day with only about 6% of awakenings in these patients – Fig. 7.
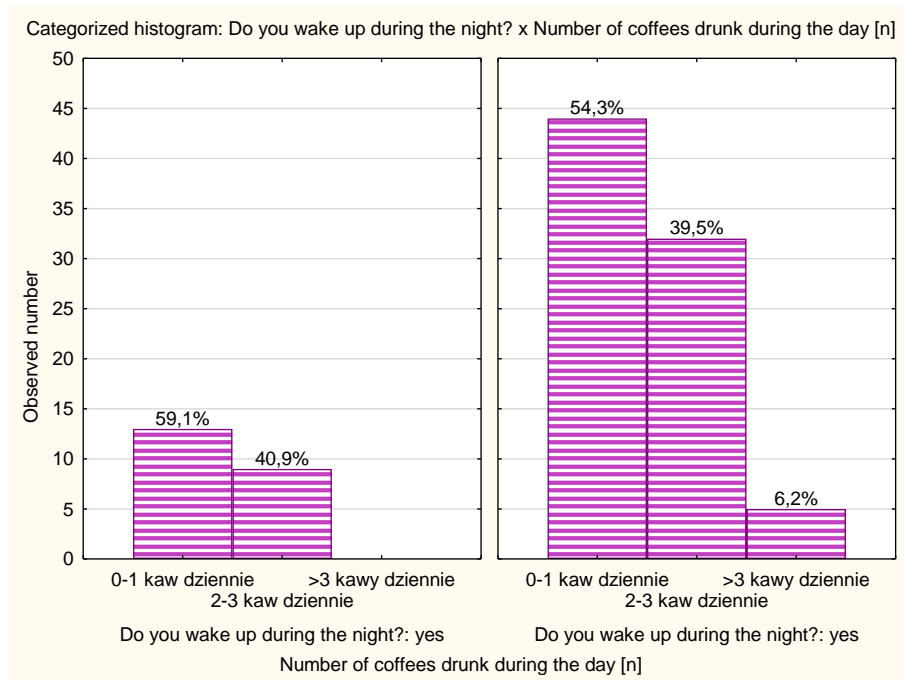
Fig. 7. Relationship between the amount of coffee consumed during the day [n] on the occurrence of night awakenings
Source: own calculations
Legend:
1 – 0-1 coffee daily
2 – 2-3 coffee daily
3 - >3 coffee daily

Another analyzed disorder related to stimulants were cigarettes, including the number of cigarettes smoked per day [n] and the length of nicotine addiction [years].

Nocturnal awakening occurred in over one third of patients with sleep apnea or symptoms indicating it, smoking cigarettes (34.6%) – Fig. 8.
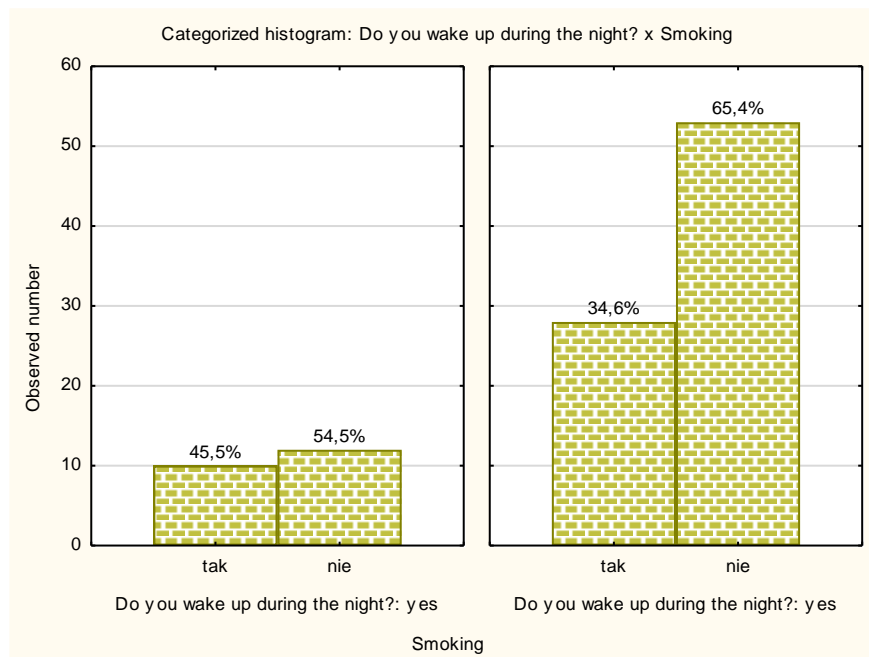
Fig. 8. Night wake up among smokers
Source: own calculations
Legend:
1 – yes
2 – no

Night sleep in patients with sleep apnea or with symptoms which are indicating it, occurred in smokers at the level of:
• 61.7% of smokers to 10 cigarettes per day;
• 23.5% in smokers 11-20 cigarettes per day;
• 14.8% in smokers above 20 cigarettes per day.
The discussed issue is presented in Fig. 9.
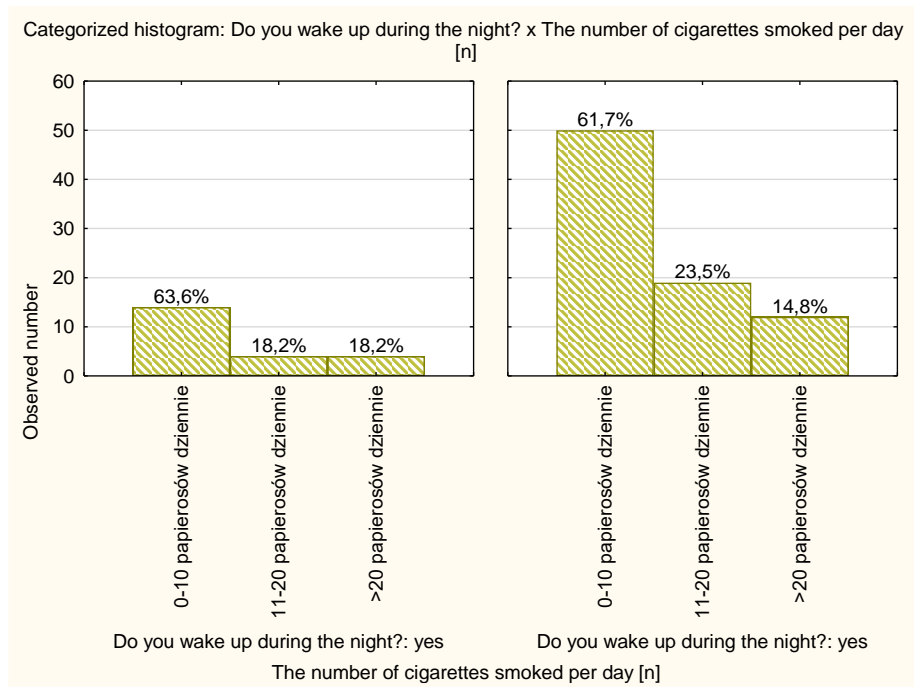
Fig. 9. The number of cigarettes smoked per day [n] and night wake
Source: own calculations
Legend:
1 – 0-10 cigarettes daily
2 – 11-20 cigarettes daily
3 – >20 cigarettes daily

As part of the study of patients with sleep apnea or symptoms indicating it, the length of nicotine addiction was also evaluated [years]. Over 60% of smokers surveyed up to 15 years old most often reported a problem of waking up at night, interestingly, those who smoked the longest (> 30 years) were only a few percent (6%) of those who wake up – Fig. 10.

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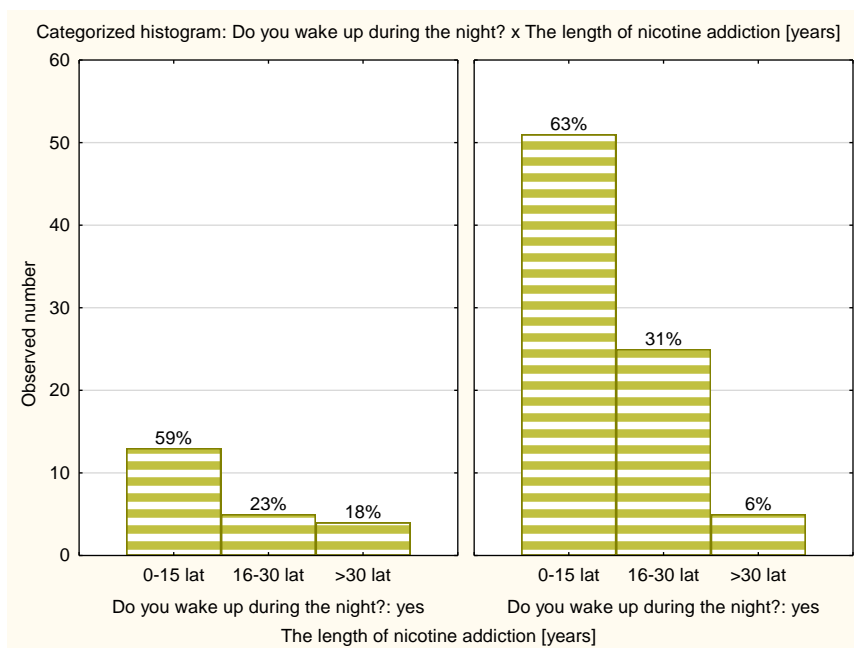
Fig. 10. The length of nicotine addiction [years] and night wake
Source: own calculations
Legend:
1 – 0-15 years
2 – 16-30 years
3 - >30 years

Discussion

Nowadays, the incidence of sleep apnea, especially obstructive apnea, increases more and more, accompanying chronic non-infectious diseases, which are very common, widely known, and at the same time most socially underestimated as states that can lead to sudden, often fatal incidents. You can mention type 2 diabetes, obesity, atherosclerosis or even hypertension. Sleep apnea very often accompanied by the occurrence of the metabolic syndrome. Scientific studies assessing the pathophysiological mechanisms accompanying sleep apnea were carried out.

Alcohol's impact on sleep has not been examined properly yet. One of the studies with mices and rats demonstrated that frequent intake of alcohol, during drinking periods and also during abstinences, caused deep insomnia, daytime sleepiness and unsettled sleep phases. In both situations, essence of sleep disorder were disrupted sleep homeostasis [10]. People who drink alcohol rarely and they are not addicted to it, primitively notice an amelioration in sleep, but larger alcohol may cause difficulties with sleep maintenance at night, especially during its second half. What is more, pre-existing insufficient sleep and short sleep intensify effects of alcohol consumption. On the other hand, alcoholics who are dependent from alcohol, are more susceptible to the development of alcoholism, due to greater tendency to sleep disturbances [11].

Coffee modifies mental state, it can cause low level of wakefulness and improves cognitive functions, but there also negative effects. One of mentioned earlier is daytime sleepiness, but also night awakening [12]. Caffeine may be included into psychoactive substances and has impact on sleep and wake function. There is no doubt that it disturbs sleep - alertness and performance are

increased, especially in restricted or modified circadian sleep or in reversal of sleep. Regular caffeine consumption is mainly linked with ineffective sleep and sleepiness during a day [13].

Smokers are more exposed to inadequate sleep (sleep which is lasting 6 hours or leess and sleep lasting 9 hours or more) than non-smokers. Compulsory smoking may be caused by inadequate amount of sleep [14]. Furthermore, smoking, especially coexisting with moderate-severe OSA, disturbs the most endothelial function [15].

Conclusions

It was estimated that drinking alcohol (especially beer at least once a week), drinking coffee (real, drinking up to 1 coffee per day), smoking (up to 10 pieces per day, nicotine addiction up to 15 years) was related to the occurrence of awakenings at night among people with sleep apnea or with symptoms indicating it.

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THE USE OF PROBLEM SOLVING TOOLS ON THE EXAMPLE OF A SERVICE COMPANY

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Abstract:

Topics related to problems occurring in enterprises and the methodology of solving them is an important aspect today. The article discusses the issue of Problem Solving tools. The aim of the article is to show the possibility of implementing the A3 report in order to solve problems occurring in the structures of enterprises. The use of the A3 report was presented on the example of a service company.

Keywords:

problem solving, 5W2H, Pareto-Lorenza analysis, Ishikawa diagram, A3 raport

Introduction

Effective functioning of the company affects the quality of products as well as the level of customer satisfaction. Problems faced by enterprises may affect the fluctuations in their functioning. It is important that organizations are able to identify the problems skillfully and then solve them. The process of conducting such an analysis can be a complicated process which requires the involvement of more people. Reflections on problem solving tools are presented in this article. The aim of the article is to present the possibilities of implementing problem solving tools on the example of a company from the service industry.

Characterization of the Problem Solving

Current changes in the economy cause that enterprises have to react quickly to emerging problems. An important element of the organization's activity is the speed of reaction to existing problems in the entire management process. However, before a response to a problem occurs, the organization needs to realize what the problem is and what the cause of it is.

In literature the word problem is defined as "a kind of task that the subject can not solve with the help of his knowledge. Its solution is possible thanks to the action of productive thinking, which leads to enriching the subject's knowledge "[1]. In the Polish Language Dictionary, it is stated that the problem is "a difficult situation which requires finding a solution" [2]. The definition of the word problem refers to the situation in which a person related to a given problem strives for the goal he or she sets, but he/she has no knowledge which will allow him/her to change the initial state into

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the final result [3]. It can therefore be concluded that the problem is a situation for which a solution should be developed. Problems in an organization can be divided into four categories [4]:

- open;
- closed;
- converging;
- divergent.

Open problems are defined as those in which the solutions, hypotheses and variants are unknown. Closed problems are those for which possible solutions can be determined and the team that deals with solving them must choose one solution from a specific pool. Convergent problems have one solution and their goal defines the end result, while divergent ones have many solutions [4]. The presented division of problems is just one of many that are described in the literature. This article focuses on the division due to the number of solutions provided for a given problem.

Problem Solving is not a simple process. Balle F. and Balle M. define seven stages of problem solving. The first stage is the transition to the place where the problem was detected. It is the transition to the so-called gemba [5]. It should be noted that making any decisions regarding problem analysis must include numbers, data, facts and the verification of the problem by means of the senses [6]. The second stage refers to the visualization of the problem. This process allows to influence the determination of the causes of the problem. Mapping of the reality also helps to illustrate the differences between the current state and the expected state [5]. The next step is the measurement process. Making precise measurements helps to understand the problem. After the actions carried out, standardization takes place. This is a process in which previously performed activities are standardized and this affects the correctness of defining the problem. The fifth stage refers to the problem solving process itself. Use of methods of analysis that will affect the final result. The penultimate stage is the phase of experimentation, that is, the implementation of activities aimed at solving the problem. The last stage is a summary of all previous activities [5].

In the literature different stages of problem solving can be determined. According to Newell and Simmon these stages are [7]:

- identify the situation in which the problem occurred;
- set a goal and determine appropriate actions;
- analyze data and solve the problem.

The process of solving problems requires the involvement of people who are directly related to the observed problem, as well as to unrelated persons. The participation of these people in the process allows to create a creative environment that will help the company to influence the solution and elimination of a given problem. During each of the above-mentioned stages the team can use tools, problem-solving techniques that will more easily illustrate a given problem, affect the verification of the reason for its occurrence and create a solution.

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Problem Solving Tools

Problem solving tools are often adapted to a given organization. Individuals who are involved in the problem solving process can use many possible methods. In this article only selected tools are described, those that have a direct or indirect impact on the problem solving process.

The first model quoted is PDCA Problem Solving. This methodology is based on the so-called PDCA cycle (Deming). It is an acronym for four English words: Plan, Do, Check, Act [8]. Activities related to the problem solving process were assigned to four individual stages of PDCA. Within each of these stages it is possible to use supportive methods, tools and techniques. In Tab. 1. individual actions within the stages of PDCA Problem Solving are presented.

Tab. 1. PDCA Problem Solving

Stage of the cycle	Operation within the PDCA Problem Solving phase	Methods, tools and assistive techniques
Plan	1. Identification and definition of the problem.	surveys,v5W2H method
	2. Setting up of a team.	community studies
	3. Study of the current state	Flow Chart, control sheet
	4. Setting up a target.	koncepcja SMART
	5. Determining the actual cause of the problem and identifying solutions	brainstorming, Pareto-Lorenz analysis, cause and effect diagram, 5Why, correlation graph
	6. Setting priority tasks	expert group method
Do	7. Implementation of created solutions and their improvement	Action Plan, Gantt`s chart
Check	8. Monitoring and then evaluation of implemented solutions	Shewhart control charts, SWOT analysis
Act	9. Application of the new standard	cause and effect diagram, Gantt1s chart

Source: Obora H., (2010), vol. 234, 323-333

PDCA Problem Solving consists of nine stages during which the problem is defined, the team is determined and the goal to be achieved is determined. The reasons for the occurrence of the problem are identified, the task schedule is arranged and solutions are then developed and implemented. By implementing individual tasks, the team can use methods, techniques and supporting tools. Such tools include the 5W2H method, the Pareto-Lorenz analysis, the cause and effect diagram and the 5Why method.

5W2H method

The 5W2H method is an acronym for English words [9]:
- What? - the problem is defined at this stage;
- Why? - it should be described why this problem appeared and what are the reasons for its emergence;
- Where? - the place where the problem appears should be determined;
- When? - when and with what frequency the problem appeared;
- Who? - identify people, employees who are related to the problem;

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• How? - present the process in which the problem occurred;
• How much? - the final stage is to determine the scope of the problem and the importance it represents.

Asking questions precisely allows to precisely determine the problem. Its identification and description are important in order to create the causes of the problem and, then, propose a solution [10]. This method can be used for problems of greater and lesser complexity. It also allows to unlock creativity in the team.

Pareto-Lorenzo analysis

The Pareto-Lorenz analysis is one of the methods used to detect the root causes of the problem that arises and is counted among traditional quality management tools. It is one of the popular methods of analysis, where by applying the 80/20 rule, it is stated that 20% of causes generate 80% of the effects [11]. The diagram creation consists of [12]:
• collecting information about the problem;
• ordering the causes in the order of their occurrence frequency;
• depicting cumulative values in a column chart;
• selecting a line that will illustrate the cumulative percentage of designated causes;
• mark points that refer to cumulative values and then connect them using lines, so-called the Lorenz curve;
• analysis and decision making.

The use of such analysis helps in determining a small number of causes that affect the errors. The Pareto-Lorenz analysis allows to identify places where improvement actions can be implemented [13].

Ishikawa causation chart

The cause-effect plot Ishikawa, also known as the fish bone chart, is the method used to identify the source causes. Its appearance resembles a skeleton of fish [14]. In addition to identifying causes using this tool, it is also possible to verify the relationship between them. The causes are described in five or six categories, i.e. 5M or 5M + E, which means [15]:
• Man;
• Method;
• Machine;
• Material;
• Management;
• Environment.

The Ihikawa chart is a universal and comprehensive tool that helps to determine the root causes of the problem.

5 Why

This method asks "why" questions. Analysis using the 5Why method must relate to two aspects. Firstly, it is verified why the error appeared and in the second place why it was not detected [16]. This analysis consists of four stages [16]:

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• collecting information about the problem;

• creating a team;

• description of the problem;

• problem analysis by asking questions.

When using this method, you should not limit yourself to only five questions. In some analyzes the cause can be determined by a smaller number of questions and in other cases by increasing it.

The tools listed are only some of which companies can use. The choice of the tool depends on the given organization, on its specificity, number and experience of the group, as well as on the clients' requirements. Among the popular methods of solving problems, apart from PDCA Problem Solving, there is also an A3 report. The name of this tool is taken from the paper size on which the analysis is carried out [17]. The A3 report acts as a report that contains the following elements [18]:

• description of the problem;

• current state;

• target state;

• cause-and-effect analysis;

• preventive actions.

The first step is to describe the problem. It is important to focus on what the problem is and how it affects the strategy, organization or process itself. The second stage refers to the determination of the current state. It is important to compare the situation to what it should be. When creating this description, you can use, for example, photos, diagrams, maps that will allow you to visualize the problem. Next, describe the target situation, set goals to which the team will strive. During this stage, it is important to compare the numbers, data and facts on the basis of which the team will know what the target situation should look like. The fourth stage is to perform a performance-and-interpretation analysis. In order to carry it out, tools should be used to help identify the cause of the problem. The last stage consists of determining preventive actions that will eliminate the possibility of re-emergence of the same or similar problem. After the analysis, an action plan should be developed along with the responsibility to implement the solutions created [18].

The A3 report is one of the simplest and most effective methods of communicating what has been analyzed in relation to the detected problem. When creating the report, various tools can be used, among others: Pareto-Lorenz analysis, Ishikawa diagram, Gantt chart, diagrams, tables, sheets for data collection, process mapping. By applying this method, enterprises can solve problems at the source of its creation. The A3 report also helps the organization make decisions based on numbers, data, facts, which in turn affects the opportunity to improve [18]. After a thorough analysis the organization will not have a similar situation to the existing one. The implemented actions allow to eliminate and prevent the reoccurrence of the problem.

Report A3 on the example of a service company

An enterprise from the service industry on the example of which was carried out analysis using the A3 report has implemented a procedure in which analyzes of the resulting non-conformities are carried out. The company also has implemented the ISO 9001 system, within which it monitors all

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undertaken activities in order to eliminate non-conformities. The main method used to analyze the problems is the A3 report.

In order to develop a report, a team, whose aim is to solve the problem, is created. The article analyzes the problem related to a large supply of promotional materials in the department. The analyzes performed are shown in Fig. 1.

Report A3	Report number: 01/2019	Responsibility: Employee 1	Date of development: dd.mm.rrrr	Status of implementation
1. Description of the problem Orders of promotional materials are not planned according to the needs of employees, which results in the storage of materials on the shelves and the floor.			**4. Cause and effect analysis** In order to conduct a cause-and-effect analysis, 5Why methods were used: 1. Why were there large amounts of promotional materials on the shelf and floor? *Because a second mail was sent with the same order to the printing company.* 2. Why was the second mail with the duplicated order sent? *Because the marketing employee did not indicate in the order book that the mail was sent.* 3. Why did the employee not mark the order in the sheet? *Because he did not know where to find such a sheet, and consequently forgot to inform his superior.* 4. Why did the employee not know where the sheet is located? *Because he did not receive the order instruction / procedure.* 5. Why did the employee not receive instructions? *As work continued on updating the system documentation, and the previous documentation was immediately transferred to the archive,* The main reason for the problem was the lack of system documentation, thanks to which the new employee would know how to proceed when placing orders for promotional materials.		
2. Current status: Currently there are 2,000 general catalogs and 1,000 leaflets on the current offer of a service company. These materials are on the shelf and on the floor. In the case of a bookcase, they occupy a space that is intended for other promotional materials, which results in inconsistencies in the implementation of the 5S method. Despite the implemented visual management, which determines the maximum and minimum of ordered materials, large stocks have been observed, generating costs for the organization. The cost is related to the storage of materials, as well as the costs incurred in relation to the employee's working time and printing costs.			**5. Preventive actions** • Implementation and training of employees in the matter of creating a new or updating the current system documentation - a formula should be included in the procedure for changes in documented information that current documents are not removed and are still valid when the documentation is updated. Making this record will avoid a situation in which the employee will not have applicable standards.		
3. Target status The warehouse should contain a maximum of 1000 catalogs and 500 leaflets. If the materials are not used within a certain time, they will be recycled, as leaflets and catalogs are planned to be updated during the			**6. Action plan** 1. Implementation of the entry in the procedure regarding changes in documented information - procedure Q23_Management documented with information_v1.		

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holiday season. In order to reduce inventories, it is planned to send promotional materials to current and potential customers. Shipping will result in the company not incurring additional costs associated with the disposal. Shipping is planned before updating promotional materials.	2. Training of employees regarding changes in system documentation. 3. Planning and execution of shipments to current and potential customers. 4. Summary meeting closing the analysis of A3.

Fig. 1. Report A3
Source: own study

The analysis made it possible to verify the cause of the problem, which was a large supply of promotional materials. It can be seen that the reason was not directly related to the material procurement process but related to the lack of a system document. The introduction of a small change resulted in a similar situation not being observed in the company. Preventive actions will also help to avoid situations in other processes. The A3 report can solve more and less complex problems and the form of the report is transparent and facilitates the analysis process itself.

Summary

The use of problem solving tools helps organizations to look more closely at the analyzed situation. Determining the root causes of the problem is affecting the further activity of enterprises. The elimination of these causes and the implementation of specific preventive actions and their monitoring ensures that a given situation will not occur again.

Changes in the area of the company's operation and customer requirements force the representatives of the organization to document the analyzes carried out in relation to the problems arising. The A3 report is not only for solving internal problems, but also for documented information. This report can be presented to clients in order to show compliance with the measures taken to eliminate the cause and consequences of the situation and prevent its occurrence in the future.

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SECURITY OF INFORMATION FLOW IN SUPPLY CHAIN MANAGEMENT OF INTERNATIONAL COMPANIES

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Abstract:

The "Security of information in the process of supply chain processes" is an up-to-date and important issue in the management of modern enterprises. This is due to the changes occurring in modern dawn. The territorial impact of the companies varies. It also changes the asset validity rating for the enterprise. Once this availability of physical resources has decided on the success of the project now in the most serious cases, it decides "knowledge". What was unattainable for companies operating 10 years ago now became a mere practice. Nobody is already unstrange to be in constant contact with people on the other side of the globe. This happens both in the business realm and in the private sphere. But these early changes have a common denominator, namely the process of processing information which must be subject to a specific security.

Keywords:

security, information, supply chain, management

Introduction

Today's business is becoming a more complex process. Make improvements. Although these improvements do not only rely on the purchase of new machines or software, they also include skillful cooperation. So companies – even from a similar industry – can complement each other, possibly "support" in crisis situations. Such solutions are currently a necessity, resulting from the specificity of the new economy.

Definition of logistics

The term "logistics" is derived from the Greek word logistikós (Logistikos) meaning a person thinking according to certain logic rules. There were no mathematical and philosophical rules at the same [1].

The rapid changes in the economy make it increasingly difficult to predict the future of businesses. Thus, it is increasingly difficult to guarantee their long-term functioning and success in the.

Until recently, to be able to operate on the global market, it was enough to deliver the product to customers. These have been characterized by the most common needs around the world. Now you also need to offer the right quality of these deliveries (so the product must reach quickly,

efficiently, etc.), but also manufacturers or vendors must meet the expectations of customers. For example, global companies may offer different worldwide availability, thus the final products are differentiated in terms of production costs. This allows you To maximize your inventory where there is the highest demand. Although the situation has now been further complicated. As a consequence, the final customer has an increasing expectation and the company must adapt to them.

As a consequence of such a change in the market, logistics is currently defined as: ' This part of the process in the supply chain which plans, implements and controls the efficient and efficient flow and storage of goods, services and relevant information from the place To the place of use to meet customer requirements" [2]. In this sense, "logistics" is a term that describes the:

a. planning process,
b. the implementation process,
c. the process of controlling,
d. efficient and efficient flow of raw materials,
e. proper delivery of the necessary materials for production,
f. creation of finished goods,
g. flow of relevant information from the point of origin to the point of consumption, so that all customer requirements can be met.

The most common definition of logistics in national literature is the definition of logistics according to Fredricka J. Beiera and Krzysztof Rutkowski. In their opinion, logistics means managing the movement and storage activities of a particular good. This makes it easier to flow products from places of origin to final consumption sites. Information is also easier to provide to the customer m.in. Appropriate level of service [3].

Definition of e-Logistics

Logistics is one of the areas of business. It is primarily responsible for supplying the final product to the customer. Moreover, the order is realized in a certain quantity and at a specific time. Thus, it is possible to identify the many processes that are necessary for transactions to be considered a successful.

One of the logistics departments, namely e-logistics, is key for this topic. The Internet is used as well as all information systems. So you can coordinate and also integrate specific actions with each other. As a consequence, a specific good is provided to retailers or consumers, according to the customer's individual expectations.

It should be noted that e-Logistics distributes the product from the information. This is why the supply chain only conveyed information about the good, i.e., where, in what quantity, when it is needed. In turn, the product is ultimately targeted at the destination, which avoids the warehouse and thus lowers manufacturing costs. This allows us to change the way logistics work, as the warehouse becomes a commercial office, not just a place of storage. In this case, the product before going down from the production line is already sold, or immediately moves to the wholesalers. This, in turn, shortens customers ' expectations for specific.

The great advantage of e-logistics solutions is that any information you are interested in is found in the network. Specific platforms are used to determine where the product is or where the order is located. The units that can offer this kind of solution are traditional logistic companies, but also electronic markets. In this case, third parties assume responsibility for the delivery process and even subcontract some of the tasks to subcontractors on their network. And e-markets – Places of sale and purchase of logistics services – are responsible for forwarding and transport. The great advantage of e-logistics solutions is that any information you are interested in is found in the network. Specific platforms are used to determine where the product is or where the order is located. The units that can offer this kind of solution are traditional logistic companies, but also electronic markets. In this case, third parties assume responsibility for the delivery process and even subcontract some of the tasks to subcontractors on their network. And e-markets – Places of sale and purchase of logistics services – are responsible for forwarding and transport.

E-Logistics, as mentioned earlier is the Logistics department. Most of its operations move to the network. So it can integrate actions, but also streamline any dependencies in chains and supply networks. With the right actions, you can improve the functioning of the market. What else can be included in the monitoring and management of the supply chain.

It is also not without significance that e-logistics allows to reduce the number of operating costs of the company. With the ability to transfer most activities to the network, using specialized software, you can significantly reduce costs. This applies to transactional, communication and operational activities. In addition, it also reduces the time of logistics processes [4].

Such benefits are much higher than those associated with them. However, e-logistics activities are not a simple and inexpensive solution. In addition, the use of electronic technologies translates into a reduction in customer privacy. While implementing the solutions appropriately, the benefits are noted in the long term [4].

In the case of previously presented ERP, Logistics has the ability to facilitate the layout of enterprise resources. What is further possible by the development of the MRP II system. For this purpose, information on possible changes in market demand is used, and it is thus possible to identify the conditions prevailing on it. All financial analyses and integration of all areas of the company's functioning are also useful, for which ERP is properly created [5].

On the other hand, in relation to CRM, this logistics uses here all the information that is gained when establishing or deeping customer relationships. This allows for the stage of sales and delivery of the final product, guarantee the proper quality of service. An example of what is even the delivery of an order at a time specified by the buyer [5].

By contrast, using SRM solutions, you can manage vendor relationships. What constitutes a direct impact on the work of Logisticians. As a consequence, the company has the ability to integrate multiple operations. This state of affairs translates into an increase in the transparency of stocks, as well as the assessment of the performance of suppliers and thus to determine which suppliers should cooperate with which it is unprofitable [6].

With regard to the application of SRM, it is appropriate to indicate the supporting areas for e-logistics activities [6]:

a. easier supplier analysis;

b. more effective management of procurement and supply activities;

c. increase the automation of individual processes – e.g. Supplying storage for specific products.

In the case of SCM, it is responsible for managing supply chains. It affects the flow of information, things, but also finances, and therefore regulates issues that relate to companies cooperating with each other. In addition, such activities are also responsible for supporting production processes as well as sales. As a consequence, it translates into strategic activities of the.

Distribution and objectives of logistics

As pointed out earlier, logistics is understood in a narrow and broad sense. In the first case, it is possible to indicate different types of logistics. The broad sense is the general importance of logistics. The term "logistics" is derived from the Greek word logistikós (Logistikos) meaning a person thinking according to certain logic rules. There were no mathematical and philosophical rules at the same [6].

The rapid changes in the economy make it increasingly difficult to predict the future of businesses. Thus, it is increasingly difficult to guarantee their long-term functioning and success in the.

Until recently, to be able to operate on the global market, it was enough to deliver the product to customers. These have been characterized by the most common needs around the world. Now you also need to offer the right quality of these deliveries (so the product must reach quickly, efficiently, etc.), but also manufacturers or vendors must meet the expectations of customers. For example, global companies may offer different worldwide availability, thus the final products are differentiated in terms of production costs. This allows you To maximize your inventory where there is the highest demand. Although the situation has now been further complicated. As a consequence, the final customer has an increasing expectation and the company must adapt to them.

As a consequence of such a change in the market, supply logistics is currently defined as: 'This part of the process in the supply chain which plans, implements and controls the efficient and efficient flow and storage of goods, services and relevant information from Place of manufacture to the place of use to meet customer requirements.' Therefore, its task is to provide the right thing in the right time, in the right place [2].

The above described situation changes m.in. Thanks to the development of E-commerce. Until recently, the place of delivery was strictly specified at the time of ordering. The solutions currently being tested are designed to provide a bilateral exchange of information between the consignee of the consignment and the logistics company. This bilateral exchange of information is m.in. Allow delivery of the consignment to the place where the consignee is located at the time of delivery, which shall be carried out at the request of the person concerned.

Referring to the e-commerce characterization it is worth noting that it is the basis for the functioning of the 21st century economy. This is generally referred to as the conduct of online activities, consisting of the exchange of goods and services, and the conduct of activities In terms of promotion and marketing. E-commerce also includes auction trading. Therefore, such activities using electronic means that allow the conclusion of commercial transactions [7].

The e-commerce itself was founded in the late 60-20th century, but it arrived in Poland in 1997 because of the widespread access to the Internet, it quickly gained importance, thus increasing the number of economic activities transferred to the network. This kind of solution has gained popularity due to the convenience of customers [7].

This is precisely why, in order to protect the rights of buyers and sellers, civil-law agreements which are concluded by e-commerce (synonymous with e-commerce) are governed by the provisions of the Civil Code and the Act on the Protection of certain consumer rights [8].

In Poland you can meet different types of e-commerce. The individual classifications are presented in Tab. 1.

Tab. 1. Breakdown of e-commerce

Classification name	Member name	Commonly used name	Entities involved in a given trade
Due to trading entities	Business tu Business	B2B	They participate in the same companies
	Business to Customer	B2C	Company and Consumer
	Customer to Business	C2B	Consumer and Company
	Customer to Customer	C2C	Consumers are connected
Due to the place of the transaction	Direct trade	-	-
	Indirect trade	-	-
	Hybrid Trading	-	-

Source: own development based on [9]

When referring to the characteristics of the second classification, the place of the transaction should be indicated. In the case of direct e-commerce, all transaction-related transactions are carried out through the Internet. Indirect e-commerce in turn combines traditional solutions with modernity. Therefore, although the order is placed and the payment is made through the network. Traditional solutions are used for delivery. A novelty in the market is electronic trading hybrid. Different transitional types are used here [9].

The great importance for the distribution of e-commerce in the world has a multitude of advantages for entrepreneurs and customers that arise from its application. You can mention here, at least, a significant reduction in expenses, related to business, or much easier to reach the customer. What is important is individual relationships, so that the customer feels appreciated by the trader. It is from the perspective of the economic operator.

Customers have the opportunity to make purchases in a convenient way and when they have real time. In addition, they are able to compare offers to choose the best opportunity for themselves. The issue of savings also applies to consumers [9].

Precisely because of the above considerations, e-commerce is now widely used. In many cases, even the market imposes an economic activity in this way because, because of its product uniqueness, it is only in this way to gain buyers. Thus, it can be conditioned on the market.

Logistics functions in the production company

For logistics, the main importance is: the flow of materials, finished goods, as well as the transfer present at the transmission of information. These activities are carried out in different logistic systems. These issues point to the procesual aspects of logistics. It's about the right place: planning, organizing and controlling logistic processes. However, in the opinion of M. Sołtysik, equality between logistics and process management cannot be put in place. In this case, "definitions (...) These include different management functions (planning, organizing and controlling), but do not reflect the process of managing organizations as a decision-making process." Therefore, divergence in logistics and management of logistics processes allow for a different approach to the issues analysed [10].

Above all, however, in logistics it is a "comprehensive knowledge of logistics processes (product flow processes – Cars.) Related to any economic activity and how these processes are effectively managed. " On this basis, it must be stated that, as logistics, it is a field of expertise that defines all aspects of logistics, including logistic systems [10].

The logistical tasks indicate the [11]:
a. knowledge of logistic processes, as well as the dependencies that occur between them;
b. creating tools to control logistic processes
c. introducing new solutions that will support efficient management of logistics processes.

The flow of products, the maintenance of inventories and the collection and processing of information are activities requiring the disposal of many technical means, which can be included in the so-called logistic process infrastructure. This Infrastructure should ensure the appropriate speed and efficiency of the product flow, protect stocks from loss of performance, and, using mass pipelines of information, enable rational control of processes Logistical and logistic [12].

The specificity of logistic processes in various industries means that the components of the logistics infrastructure must correspond to this specifics both in terms of construction and technical sophistication. Irrespective of these differences, the main links to the logistics infrastructure can be divided into [13]:
a. Storage Infrastructure – It is used to store inventories and create them: warehouse buildings (buildings, shelters, reservoirs and trays) and storage areas,
b. Transport infrastructure (internal and external) – allows the movement of cargo and includes: internal transport equipment (cranes, conveyors, manipulators, transport trolleys, loaders, etc.) and linear and point Road, rail, water and air transport infrastructure and means of transport used in the various modes of transport,
c. Packaging infrastructure – Its main function is to protect the goods being moved, as well as to improve movement and manipulation,
d. IT infrastructure-it consists of equipment and techniques enabling the processing and transmission of information necessary for the control of logistic processes: IT equipment and it techniques, means of communication, techniques such as Barcodes.

Summarizing the considerations concerning the essence of logistics, it can be repeated by S. Niziński and J. Crane that modern logistics can be treated as [14]:

a. principle, concept of thinking and action,
b. an integrated decision-making process relating to the management of physical goods and information,
c. integrated enterprise function,
d. the management and operation method,
e. the steering concept,
f. activity oriented towards rational exploitation of the potential for efficiency and growth of the company's competitiveness,
g. the concept of stimulating the achievement of business objectives,
h. company organisation concept.

The above-mentioned treatment of logistics is the result of evolution from the market-oriented logistics stage of the manufacturer, through intermediate stages (consumer market, logistic process integration) to the current period of logistics development characterised by m f. ex. Widespread use of computer technologies or globalisation of the economy and logistics.

The flow of goods in kind is the cause of logistical costs. These costs, acting as an essential component of logistics, affect the overall economic efficiency, keeping stocks, engaging in substantial capital. The functioning of the business process infrastructure is not negligible.

One of the basic tasks of modern logistics is to reduce the cost of flow and maintain stocks. These costs are an important component of the cost of business. In the case of their reduction by integrated logistical measures, it becomes an important source for improving the economic operators.

Logistic process infrastructure is a typically logistical term. This implies that it uses all of its assets as well as personal resources. In this case you can observe the so-called. Substitution phenomenon. A higher level of mechanization is used here as well as automation of transport, handling, etc. For this purpose, however, it is necessary to dispose of appropriate financial resources. This, in turn, allows for increased productivity, as well as job reductions. On this basis, this infrastructure should be seen as a technical and organisational system based on a reduction in the cost of [15].

So also the perceived infrastructure of logistic processes, consists of many elements. Among them should be mentioned even [15]:
a. means of transport, as well as manipulation, permitting the movement of certain consignments of products between organisations or within the various sections of a single economic operator;
b. buildings and warehouse buildings where storage and preservation of stocks are available, although there are also products that must be kept in stock,
c. packaging of products, primarily responsible for the protection of products in transport, as well as the possibility of transport in general;
d. the necessary means of processing information, here you can identify relevant equipment and systems that allow the flow of information.

With infrastructure, you can coordinate processes. This coordination increases the activity of the:

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a. achieving the maximum possible compliance of objectives with the realities;
b. adapting to the expectations of market customers;
c. to indicate the use of resources that are common to each department, so that the use of them does not lead to congestive or lead to collisions;
d. making terms of the desired time for the performance of a given service and specifying the time frame for the implementation of the various stages of the implementation [16].

It is equally necessary to refer to the transfer of information that was mentioned earlier. Several types of data transfers are subject to this. Presented in Fig. 1.
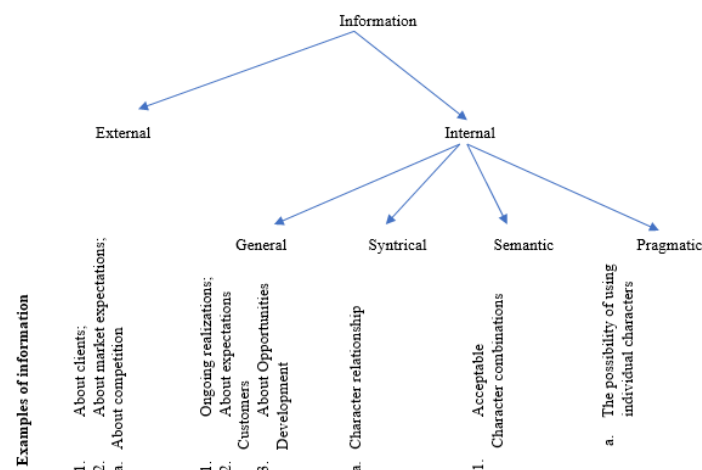
Fig. 1. Types of information transferred in the logistic process infrastructure
Source: own development based on [16]

As indicated above, a lot of information flows in the logistics infrastructure. They should also be appropriately managed. This means that an additional intangible resource is acquired, which is knowledge. It determines the proper control and management of the remaining resources, deciding on the success of the project, possibly failure.

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CRYPTOGRAPHIC CURRENCY BITCOIN

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Abstract:

The article presents cryptographic and decentralized Bitcoin currency. The creation of it by Satoshi Nakamoto gave the opportunity to start a great change in the field of finance and financial settlement on a global scale. The Bitcoin project is a forerunner of the blockchain revolution, which enters the world of finance with great strides and can change the system of settlements between people in the world. Such settlements become comfortable and very fast. The work also presents the principle of system operation and making transfers between users. The way of acquiring new bitcoins, which is obtained by making available computational power to solve complicated math problems. Finally, changes in prices from the beginning of technology and factors influencing the popularity of Bitcoin are presented.

Keywords:

bitcoin, cryptocurrency, blockchain. Nakamoto

Introduction

Information from the bitcoin.org project website indicates that bitcoin can be interpreted as a decentralized digital currency whose units are created on the internet. However, Bitcoin has some properties that differentiate it from traditional currencies. It does not appear in physical forms, such as coins or banknotes. Due to the decentralized nature of Bitcoin, the transfer of funds takes place directly between users, without supervising or intermediary institutions, which allows for a significant reduction or even elimination of transaction fees. Bitcoin is available in every country, regardless of the level of banking system development, thanks to its general availability on the Internet. An account in that currency belongs directly to the owner and it is not possible to freeze it, even by the state services. Another advantage is the lack of any formal requirements, restrictions or limits, which makes the Bitcoin project open to everyone [1].

Bitcoin does not have a strictly determined definition, thus one can find a definition from amateur websites or free online encyclopaedia rather than from generally respected sources. Digital currency is described in the English-language Wikipedia [2] as an alternative means of payment, which we use for example in online games. We pay a sum of Polish zlotys, for which we receive virtual credits to be used in bookmakers' betting, online casino or browser strategic games. Bitcoin is also often referred to as crypto-currency (although the wording "cryptographic currency" may

seem more correct in terms of language) and English-language Wikipedia also refers to it. According to this encyclopaedia, cryptocurrency is a digital currency based on cryptography and operating in a decentralized peer-to-peer network. The bitcoin.org [3] indicates that bitcoin uses peer-to-peer technology to conduct transactions and create new bitcoins in an environment without central authorities and banks. Going further, on the bitcoin.org website, we can also find bold text that says Bitcoin is an open-source project that is publicly shared, which has no owner and which no one controls and in which everyone can participate. On the other hand, A. Piotrowska [4] very generally indicates that "Bitcoin is an electronic payment and investment instrument operating in the IT space. It is very similar to the widely used and widely accepted electronic money."

In financial terms, bitcoin can be present as a currency similar to the dollar or euro, except that it is not controlled by state authorities or central banks. It can be purchased at online exchange offices, generated in the extraction process or purchased in direct transactions with other users. Bitcoin can be used to pay, usually faster and cheaper than traditional bank transfers, especially in the case of foreign transactions. For people who care about their privacy, it is important to note that transactions in bitcoins are considered anonymous and using appropriate precautions, the storage of bitcoins and transactions carried out with them can be totally private [5].

Therefore, there is no unambiguous definition of bitcoin, which could be cited in one or two sentences. Bitcoin is a modern project whose success depends on how many people believe that the sequence of zeros and ones, not supported by any official institutions, can have real value. The attractiveness of bitcoin is primarily due to the lack of a central management unit. The life in times of high economic growth, which is also associated with economic fluctuations, more frequent and more severe economic crises cause that many people are afraid of the bankruptcy of banks and, consequently, the loss of life savings. It is worth noting that one of the biggest increases in bitcoin in history, when its price significantly exceeded $ 200, fell in the period of April 2013, when the Cypriot government prevented citizens from withdrawing cash from ATMs. The level of confidence in central banks dropped immediately, which resulted in greater interest in cryptocurrencies.

Fig. 1. The picture of Bitcoin
Source: Bitcoin.pl

Genesis

The history of Bitcoin goes back to October 31, 2008, when the manifesto titled "Bitcoin: A Peer-to-Peer Electronic Cash System" appeared. In its summary, one can read:

"A purely peer-to-peer version of electronic cash would allow online payments to be sent directly from one party to another without going through a financial institution. Digital signatures provide part of the solution, but the main benefits are lost if a trusted third party is still required to prevent double-spending. We propose a solution to the double-spending problem using a peer-to-peer network. The network timestamps transactions by hashing them into an ongoing chain of hash-based proof-of-work, forming a record that cannot be changed without redoing the proof-of-work. The longest chain not only serves as proof of the sequence of events witnessed, but proof that it came from the largest pool of CPU power. As long as a majority of CPU power is controlled by nodes that are not cooperating to attack the network, they'll generate the longest chain and outpace attackers. The network itself requires minimal structure. Messages are broadcast on a best effort basis, and nodes can leave and rejoin the network at will, accepting the longest proof-of-work chain as proof of what happened while they were gone" [6].

The text presents the rules for the introduction of a digital currency based on cryptography. Eliminating the need for transaction flow by financial institutions. Based on trust in the user's network, where everyone can check the history of money transfer from the beginning of the network. The text was published on the Internet by Satoshi Nakamoto, but the author's identity has not been determined to this day. Many people think that it cannot be one person but the group of people using the pseudonym Satoshi Nakamoto, because the Bitcoin algorithm is prepared and created in a perfect way, it does not contain mistakes and no one is able to break it. Such an algorithm development certainly required many corrections and repeated checks to detect errors. There are also people who think that Nakamoto may be a genius for the 21st century [7].

The solutions described in the Satoshi manifesto were revolutionary and ready for immediate implementation. On January 3, 2009, Nakamoto launched the Bitcoin network and generated the first transaction block called the Genesis block. Satoshi also created the first version of the virtual currencies portfolio - Bitcoin Core. Until the end of 2010, Nakamoto kept in touch with group members who were involved in developing its cryptocurrency. Eventually, contact with the creator of Bitcoin broke off after one of the programmers involved in the project was invited by the Central Intelligence Agency of the United States (CIA) for an interview. The mystery of the creator of Bitcoin's creator was later discussed many times by the press, Internet users and authorities, unfortunately, despite many leads and people claiming to be Satoshi Nakamoto, no one presented convincing evidence on this issue [8].

Mining

Mining or extraction is the process of obtaining bitcoins by sharing the computing power of a computer. The name of this process, which is also called mining, is a reference to gold mining in the past. The number of bitcoins (analogous to gold) that is possible to extract is limited and it is not possible that there will be a more virtual currency on the market than the 21 million assumed in the

project. Each extraction reduces the remaining pool that can be obtained and is properly spread over time. The Bitcoin project assumed that on average every 10 minutes should be generated another block, and the network will receive new bitcoins as part of the prize for the holder of an excavator - a computer that extracts bitcoins. However, the Bitcoin project was not able to predict the scale of unavoidable technical progress, so limiters had to be imposed on users extracting virtual currency. If such limitations did not exist, it would be easy to imagine a scenario when the super-computers with gigantic power are involved in the Bitcoin project and they mine all Bitcoins in a very short time. One of the limitations of coin extraction is the parameter called difficulty. The difficulty is an artificial limitation that protects the market against too large virtual coin growth over time, and its value can be understood as the complexity of the mathematical task of block mining in comparison to the simplest block in history, i.e. block number 1. The difficulty is recalculated every 2016 blocks and adjusted so that the solution of the next 2016 blocks takes about two weeks. The value of the difficulty significantly affects the excavator market, which in turn affects users to build more and more efficient devices. On the other hand, continuous technological progress and the increase of computing power influence the increase in mining difficulty [9].

Bitcoin operation

Bitcoin is a virtual currency, this term means that it is the unit of account that operates only through computer networks, but it is possible to store it outside the digital environment (e.g. in the form of printed private keys). The Bitcoin database is a ledger, similar to those used by banks that conduct settlements in fiat currencies, however, it differs in several essential features. The bitcoin database has no centre - one server on which it is stored and accessed by specific people, as is the case with traditional banks. It is distributed among all bitcoin users who will install the so-called full node and none of which can change anything in the record because these databases are interconnected. In addition, all records in the bitcoin database (i.e. transactions made) are public and any user, at any time, having access to the internet, can check any transaction ever made using bitcoins - its timing, amounts and transaction party identification, i.e. their public keys that can be specified as equivalent to bank account numbers, not the name of user. The bitcoin blockchain accounting book is organized in such a way that on average every 10 minutes a new network element is generated - a block containing transactions ordered in time from the generation of the previous block. Thus, the database grows with each newly generated block, and all are stored on the network. Special users called miners are responsible for generating new blocks. Their presence is related to the proof of work algorithm, which in bitcoin is a system responsible for solving the problem of double-spending of funds. This problem was one of the main obstacles to the creation of decentralized digital currencies, independent of banks and other financial institutions. Previously, the only way to avoid the situation when someone spent their money many times, was the existence of an arbitrator, for example, a bank or financial institution, which, through digital signatures, ensured the compliance of the funds spent. In bitcoin, a consensus on the compliance of these transactions is achieved instead, and it is necessary to work for miners, competing for the calculation of a special number (hash), which is used to sign a new block. The miner, who accomplishes this before others, receives the prize in the form provided by the algorithm,

a specified number of newly created bitcoins and transaction fees declared by users since the last block [10].

We will look at how a Bitcoin transaction can look between two users. First, User 1 must know the User's account number 2. It can be sent by e-mail or in the form of a QR code. The address intended for the transaction can be both used permanently by the addressee and generated at one time, specifically for the purpose of one transfer of bitcoins. Next, using the selected Bitcoin client, user 1 orders and signs with his private key the transfer of the appropriate amount to the given account. At the same time, User 1 provides its public key and distributes transaction information to all users of the Bitcoin network. If the malicious User 3 has changed the destination address in the distributed transaction and distributed it to all computers in the network, the transaction would be rejected. This is because User 3 does not have User's private key 1 and is not able to re-sign the message so that it can be accepted by other users who will verify on the basis of the public key of the real sender - user 1. Information about the transfer will appear on the User's account 2 almost instantly with the initial status "not approved". In order for the transaction to be approved and that the appropriate amount of bitcoins be credited to the recipient's account permanently, it must be accepted by the peer-to-peer network. Information about the transaction is sent to the nodes in the network, including those to the public, such as for example blockchain.info - the page publishing the entire history of Bitcoin transactions in the form of a friendly interface. Due to an unconfirmed bitcoin transaction, they are not added to the User's account, they only expect to be unapproved. Only after the approval of the network, funds get to the User 2 [11].

Bitcoin prices

Bitcoin is one of the most expensive cryptocurrencies on the market, its value reached around PLN 50,000 in 2017. It remains the oldest well-known token with an established market position, whose market capitalization, like Bitcoin Cash, Dash, and Ethereum exceeds one billion dollars. As a means of payment, it is often used by users all over the world, who recently also decided to actively use other cryptocurrencies, such as Ethereum. Fig. 2 shows the upward trend of the Bitcoin exchange rate to PLN, from the beginning of existence to the present day, i.e. on 29.07.2019.
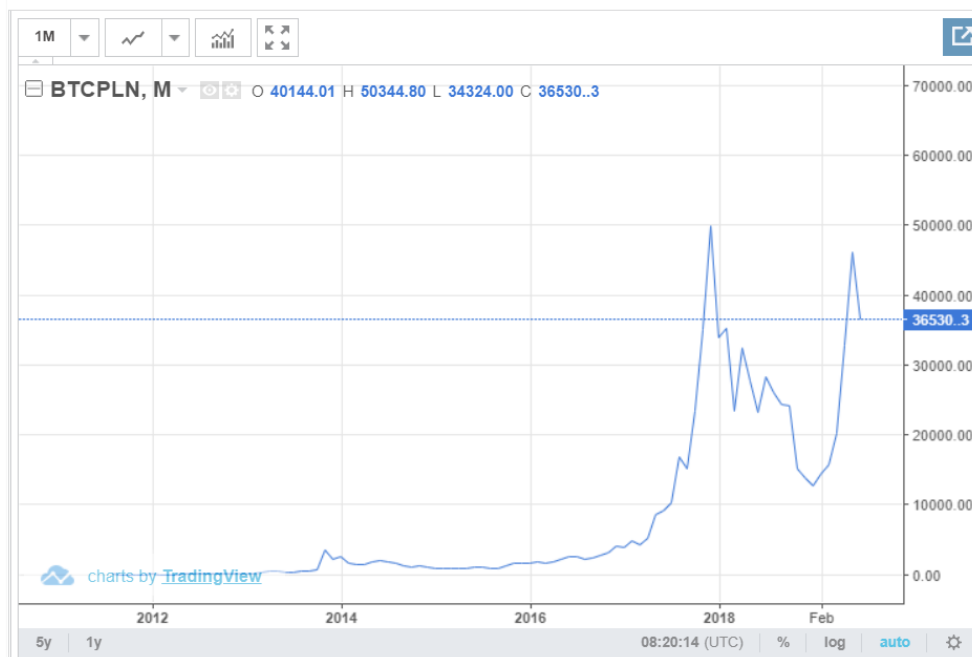
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Fig. 2. The price of Bitcoin 2008 – 2019
Source: tradingeconomics.com

Initially, Bitcoin was distributed to people, who take interests in this new technology or it could be bought for one cent. Over time, its price began to grow at a slow pace. The year 2013 was special for Bitcoin. This year, after several years of presence in the market on the wave of growing popularity, there was a very large price jump, followed by a huge drop in the price. The year 2013 bitcoin began with a stable price of several dollars. The first dramatic events took place in April, and one of the factors that had a significant impact on them was the Cypriot theme and the blockade of ATMs and funds on the personal accounts of the inhabitants of the Mediterranean island. Bitcoin price significantly exceeded PLN 700, which was met with great interest of the media and investors. Information about bitcoin could be found on every major information portal, and there was no end of speculation. Some considered bitcoin to be a huge speculative bubble, which must break sometime. Another group saw it as a great opportunity. There were also so-called "Sunday investors" who did not fully understand the idea, who saw a chance for quick earnings in the upward crypto value. Until finally, it happened on April 10, 2013, the bitcoin rate fell and from the level of PLN 900 was under the line marking. This fall was only temporary because already in November 2013, the price reached the price of PLN 3,300. From then on, the popularity of Bitcoin began to grow and cover the whole world. Many people started making money on Bitcoin which caused it to be known and recognized so quickly. The price at the end of 2017 reached almost PLN 50 000 followed by a sharp drop in the price. But at the turn of June and July 2019, the price returned to PLN 48 000. Very strong price increases Bitcoin can be observed in the case of local crises and problems with inflation. This is the case, for example, in Argentina, where Bitcoin and other cryptocurrencies have become a safe haven for high inflation in the country. Inhabitants of this country, fearing the rapid loss of their savings, start to store their money in the cryptographic form [12].

The future of Bitcoin is tough to define. Bitcoin supporters suggest that it will be worth a million dollars or even more. However, its opponents are convinced that it will become worthless when states and large corporations introduce their cryptocurrencies. Regardless of whether the first or second scenario will take place, another revolution is approaching, similar to the Internet. Blockchain technology will change the way payments and make them really fast [13].

Summary

Virtual currencies appeared for the first time in the context of online portals offering various types of services, especially in the computer games industry. However, such payment methods were only local, limited to a given website. In 2009, the Bitcoin project began, the success of which resulted in the creation of other digital currencies, often based on a similar protocol. Alternative currencies introduce some modifications to the original concept of bitcoin, eliminating at the same time certain defects or adding new properties, for example, practical applications of calculations related to mining. As with other currencies or gold, the success of Bitcoin will depend on the trust of people who choose to make various types of transactions using this cryptocurrency. The fact that no government or institution stands behind bitcoin can be both an advantage and a disadvantage. However, there is a chance that in the period of positive changes in the economy, some investors will decide on risky investments, which bitcoins undoubtedly belong to. Bitcoin does not have a physical form and is in fact only a collection of data stored on the computer's hard drive. The history of this virtual currency begins with the work of a mysterious person, hiding under the pseudonym Satoshi Nakamoto, who already in 2008 described this idea. Bitcoin is consistently growing, and 2013 was undoubtedly a breakthrough for it, after which both the growth of Bitcoin popularity and alternative cryptocurrencies and all Blockchain technology took place. At present, large banks, corporations, and states are conducting research on this technology, which may result in huge changes in the issue of financial settlements.

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STUDY ON THE APOPTOSIS AND NECROSIS OF HUMAN FIBROBLAST INDUCED BY T-2 MYCOTOXIN

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Abstract:

T-2 toxin is a mycotoxin produced by fungi for *Fusarium* species and is known for its cytotoxic effects on mammalian organisms. Exposure to T-2 toxin induces multiple organ disorders and it is considered, that they are the result of necrosis. In this report, we evaluated the cytotoxic pathway (necrotic as well as apoptotic) induced by T-2 mycotoxin in normal human fibroblast cell line (Hs68). The apoptosis and necrosis of cells were evaluate using flow cytometry with FITC Annexin V Apoptosis Kit. While caspase activity was measured using CellEvent[TM] Caspase-3/7 Green Detection Kit. The results showed that T-2 toxin causes necrosis depending on the dose used. The our results clearly confirmed the case study observation where contamination of skin by T-2 toxin results its strongly necrotic changes.

Keywords:

T-2 toxin, flow cytometry, fibroblasts, necrosis, caspases

Introduction

T-2 toxin is a fungal secondary metabolite belonging to the type A Trichothecenes. This toxin has ring structure and is synthetized by several *Fusarium* species, such as *F. poae, F. sporotrichioides, F. acuminatum* [1, 2]. Among the Trichothecene family, T-2 toxin is the most cytotoxic substance. Over the years, there have been many reports from various areas of the world describing the association of T-2 mycotoxin with damage to farming and highly toxicity. T-2 mycotoxin is commonly found in wheat, oats, barley and rice making T-2 toxin contamination an omnipresent and serious problem [3].

T-2 toxin causes a spectrum of adverse effects on humans or animals and induces multiple toxic reactions in a wide range of the cell types. This toxin involves a number of cellular factors that are important for cell cycle, stress responses and cell death [4, 5]. Exposure to T-2 toxin manifests harmful effects in some experimental animal modes, which exhibits necrotic changes in various organs such as brain, kidney, gastrointestinal bone marrow, lymphoid or reproductive organs.

Multiorgan effects including diarrhea, emesis, weight loss, hemostatic derangements, cardiovascular alterations, immune suppression, nervous disorders and bone marrow damage [6].

What is more, T-2 mycotoxin is more potent that sulphur mustard in producing skin injury. Dermatotoxic effects of this toxin are characterized as enterohaemorrhagic dermatitis. T-2 induces intradermal hemorrhage, edema and necrosis of the skin [2, 7].

T-2 mycotoxin is known to inhibit protein synthesis and also reported to induce changes in DNA, potentially causing DNA fragmentation [8].

Previous research performed by our team showed that T-2 toxin induced in both dose and time-dependent manner cytotoxicity relative to normal human fibroblast - Hs68 cell line. In this study we aimed to evaluate pathway of cytotoxic effect of T-2 mycotoxin by measurements annexin V and propidium iodide as well as caspases activity.

Materials and methods

Chemicals and Reagents

T-2 toxin (nr cat. T4887), Camptothecin (CPT) and formaldehyde were purchased from Sigma Aldrich (St. Louis, MO, USA), FITC Annexin V Apoptosis Kit was from BD Biosciences (San Jose, CA, USA) and CellEvent[TM] Caspase-3/7 Green Flow Cytometry Assay Kit was from Invitrogen (Carlsbad, CA, USA). PBS and was purchased from Lonza (Basel, Switzerland).

Cell culture

The experiments were performed on a normal human fibroblast cell line - Hs68 (CRL-1635; ATCC), obtained from American Type Culture Collection (ATCC[TM], Manassas, VA, USA). The cell line was placed in a humidified incubator at 37 °C with 5% CO_2 atmosphere in a DMEM medium supplemented with 10% Fetal Bovine Serum (FBS), 100 U/ mL penicillin, 100 ug/ mL streptomycin and 2 mM L-gluthamine. Cell culture reagents without FBS were purchased from Lonza (Basel, Switzerland). FBS was obtained from Biowest (Riverside, MO, USA). For the flow cytometry analysis, cells were seeded in 6-well plates, at 1 x 10^5 cells per well and were cultivated overnight. Next day, cells were treated with increasing concentrations of T-2 toxin (1 µM, 10 µM and 100 µM), CPT in 6 µM and were incubated for 24 and 48 h. For caspases activity detection, cells were seeded in black 96-well plates, at 5 x 10^4 cells per well and were cultivated overnight. Next day, cells were treated with increasing concentrations of T-2 toxin (1 µM, 10 µM and 100 µM), CPT in 6 µM and were incubated for 24 and 48 h.

Apoptosis/necrosis

Apoptosis and necrosis were evaluated by flow cytometry with FITC Annexin V Apoptosis Kit. The cells were washed twice in cold PBS and suspended in 500 µL 1X Binding Buffer at a concentration of 1 x 10^6 cells/mL. A 2 µL of FITC Annexin V and 2 µL PI were added to each 500 µl sespension and well mixed. Samples were incubated for 15 min at RT in the dark before measurement. After the incubation 500 µL 1X Binding Buffer was added and samples were analyzed by the PARTEC CUBE 6 (Görlitz, Germany) flow cytometer using 488 nm excitation.

Gates for PI (630 nm Longpass filter) and FITC (536/40 nm filter) fluorescences were estimated based on the fluorescence of unstained probes.

Caspases activity

To determine the activity of caspases, CellEvent^{TM} Caspase-3/7 Green Flow Cytometry Assay Kit was used. For that, 50 µL of CellEvent^{TM} Caspase-3/7 Green Detection Reagent prepared in PBS was added to each sample of the 96-well plate. After incubation (30 min at 37 °C, 5% CO_2) 50 µL of formaldehyde prepared in PBS was added to each sample to fix the cells. The caspases activity was determined after 15 min incubation at 37 °C with 5% CO_2 atmosphere by measuring a fluorescence intensity of cells at 485 nm excitation wavelength and an emission wavelength of 528 nm, using a BioTech Synergy HT Microplate Reader (Bio-Tech Instruments, Winooski, VT, USA). Cells were analyzed in three independent experiments.

Statistical analysis

All experimental values elaborated using Microsoft Excell (Redmond, Washington, USA) presented in this study were expressed as mean ± standard deviation (SD). The statistical analysis was performed using StatsDirect statistical software V. 2.7.2. (Cheshire, UK). First, results were analyse to verify the the normality of the distribution by the Shapiro-Wilk test. Next, the results were analysed for equality of variance using Levene's test. The significance of the differences between the values was analysed using ANOVA: Tukey's range test (for data with normal distribution and equality of variance) or the Kruskal-Wallis test; $p < 0.05$ was accepted as statistically significant.

Results

Using double-staining flow cytometry method we observed that incubation of in normal human fibroblast cell line (Hs68) with T-2 mycotoxin resulting both dose dependent and time dependent manner increasing of propidium iodide fluorescence which was related with necrosis process of cells. In Fig. 1 we presented results obtaining during this analysis. In the highest tested concentration of toxin – 100 µM the % of PI stained cells was 79% after 24 h of incubation (Fig. 1A) and 93% after 48 h of incubation (Fig. 1B).
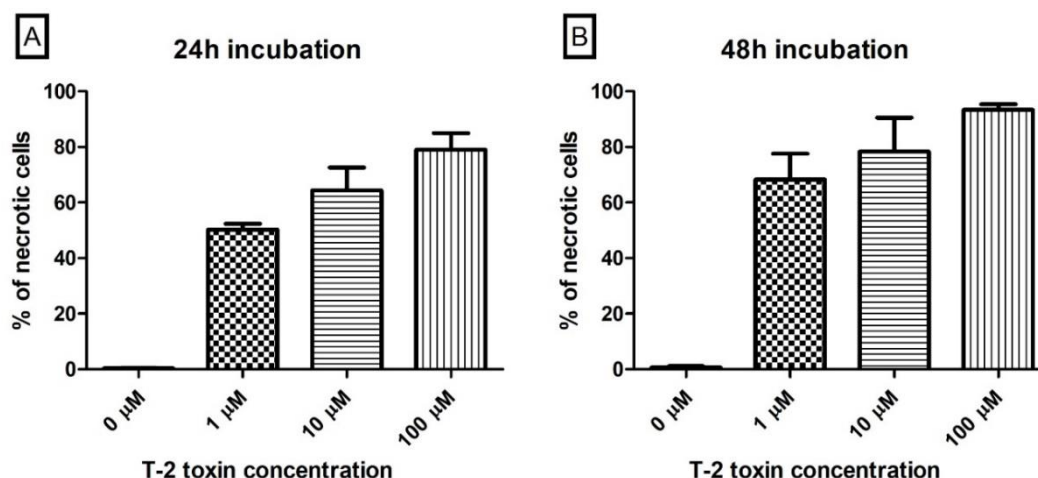
Fig. 1. Effect of T-2 toxin on necrotic cells formation in human fibroblast cell line (Hs68) after 24h (A) and 48h (B) of incubation
Source: own calculations

During the caspases activity estimation we observed that treatment the human fibroblast cell line (Hs68) by T-2 mycotoxin have no influence on 530 nm fluorescence, which clearly indicated that T-2 mycotoxin does not activate Caspase-3/7.

Discussion

T-2 is the most toxic mycotoxin of the type A Trichothecenes produced by various *Fusarium* species e.g., *F. poae*, *F. sporotrichiodes*, *F. acumimatum* [9]. These species grow a variety of cereals, especially in oats, maize, barley, rye and wheat, particularly in cold climate regions or wet storage conditions [10]. The presence of mycotoxins decreases the quality of agricultural products resulting in economic losses. Additionally consumption of food contaminated by mycotoxins is a serious health hazard for humans and animals [11]. This mycotoxin has a broad spectrum of activity towards various types of cells. It is a severe inhibitor of the protein, and nucleic acid synthesis [12]. A number of studies showed that T-2 toxin causes cytotoxic effect in various cell types *in vitro* such as Vero cells, Jurkat cells, U937, HL-60 or human liver cells. Harmful effects are also demonstrated *in vivo* in a mice model in a various organs and tissues including brain, kidney, bone marrow [13, 14].

Necrosis is a form of cell damage which results in the death of cells in living tissue by autolysis. In contrast, apoptosis is a naturally occurring programmed and targeted cause of cellular death and often provides beneficial effects to the organism, necrosis is almost always detrimental and can be fatal. Cellular death due to necrosis results in the loss of cell membrane integrity and an uncontrolled release of products of cell death into the extracellular space. These event are responsible for the development of inflammation and further tissue damaging [15].

In current paper we clearly demonstrated that T-2 toxic is responsible for necrosis process in the human fibroblast cell line, we observed strong destruction of the cell membrane without population of apoptotic cells. Additionally to exclude the possibility of observation of late apoptosis

47

we have use the caspases activity assay. Caspases family members are relevant in the process of apoptosis and they are precisely regulated in the process of apoptosis. When caspases are hydrolyzed by upstream of proteases and become activated, they will partake in the process of apoptosis [16]. In this test we did not observed any changes in caspases activity in cells treated by T-2 toxic, which confirmed lack of apoptosis events.

The result obtained in this study for the first time evaluate mechanism of cytotoxic effect of T-2 toxic on the human fibroblast cell which explain observed in past events the effect of T-2 toxin on human skin damage. In future the molecular studies will be necessary to explain detailed mechanism of necrosis induction in this cells.

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THOMAS MANN'S „THE MAGIC MOUNTAIN"
AS AN INSPIRATION FOR A POLEMIC ABOUT THE VALUES OF LITERATURE

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Abstract:

The aim of the article is to reconstruct the supposed reasons for which the discussion of the New Wave poets, initiated by Stanisław Barańczak's *The changed voice of Settembrini*, focused on Thomas Mann's *The Magic Mountain*. The main thread of the article relates to the inspiring evocativeness of one of the characters, Leon Naphta. The author emphasizes the special place of *The Magic Mountain* in Mann's work, published after the release of *Considerations of a nonpolitical man*. The novel was written when the writer's views were changing due to the experience of the First World War. The article considers the similarities between the situation of Hans Castorp and Polish poets in the 1970s − it was necessary to define their views, taking into account the reasons represented by people with extremely different beliefs. The author also notices the similarities between the popular discourse on diseases and the imagery of the poetic texts of the New Wave.

Keywords:

Stanisław Barańczak, Thomas Mann, The Magic Mountain, poetry, values in lierature

Introduction

Thomas Mann was a prolific writer of international renown. The writer, who was infatuated with Germany and who often made comparisions between his own works and that of Goethe, during the Second World War was forced to emigrate from his homeland. Fleeing from the Nazi country was necessary. It is worth mentioning that the totalitarian system from which Mann tried to escape is often analysed in Polish literature. Mann's popularity can also be observed in various literary works. Jerzy Łukosz writes:

„For Polish intelligentsia Thomas Mann served as a symbol; he was not just a part of history, ideas or bourgeois ethos – he was a symbol. Praeceptor mundi, poeta doctus – but not a literary forefather! It is extraordinarily impressive that behind the Iron Curtain Mann had so many admirers who never displayed over-familiarity and adversaries who admired him" [1].

Of exceptional interest is *The Magic Mountain* [2], which is the subject matter of Katarzyna Bałżewska's monography [3]. In Polish literature there are countless references to the Mann's novel

– it is an inspiration for Stanisław Barańczak, Czesław Miłosz, Paweł Huelle, Stanisław Lem, Józef Łoziński, Marian Promiński and many others.

One example of the reference to *The Magic Mountain* [2] is Stanisław Barańczak's in essay *The changed voice of Settembrini* [4] in which the writer deliberates on a heated argument beetween two characters from Thomas Mann's novel: Lodovico Settembrini, who is a staunch supporter of humanists, and Leon Naphta – a Jesuit and a proponent of authoritarian methods of ruling a country. The book unwaveringly seems to inspire writers to transpose the conlict from the novel into the real world.

Barańczak presents the dispute as if it was happening nowadays rather than in the times depicted in the novel, namely seven years preceding the World War One. He points out that at present it is impossible to remain unaffected by the dispute, because sitting on the fence is tantamount to being a supporter of Naphta − a prime example of an authoritarian personality. Today it is art that plays the crucial role in taking a stand against Naphta. Art is the present Naphta's opponent, Settembrini, asserting fundamental human rights by investigating the modern reality and keeping a wary eye on the language used in official discourse. Barańczak truly believes that poetry is able to create new principles taking an individual man into consideration.

The aim of the article is to reconstruct hipothetical reasons for choosing Thomas Mann's *The Magic Mountain* as Barańczak's inspiration to write an essay pondering on the issue of values that ought to be presented in literature.

The year 1975, being a centenary of Mann's birth and the 20th anniversary of his death, provided a great opportunity to take a closer look on Mann's literary works. However, it is interesting to speculate on the reasons why it was that particular book that spurred Stanisław Barańczak on to deliberate on the values of literature and the role of an artist in communist Poland, rather than any other novel written by Thomas Mann.

The most plausible explanation of the great influence of *The Magic Mountain* is provided by the novel itself, considering how evocative and thought-provoking is one of the characters presented in the novel, namely Leon Naphta. This character could have been associated by Barańczak with the examples of authoritarian personality presented in Erich Fromm's *Escape from freedom* [5].

Another reason for *The Magic Mountain* being an important point of reference to the poets of the New Wave (a poetic group in communist Poland that focused on the language of official discourse in order to provide an incentive for the readers to start thinking independently and remain adamant to propaganda) is one of its main subjects, namely tuberculosis. Poets of the New Wave often referred to various aspects of public life using methaphores connected with illnesses and medicine. A novel examinig examples of one particular illness, namely tuberculosis, and giving insight into the life of patients in the Davos sanatorium, seems to have a lot of inspirational potential.

An important place of *The Magic Mountain* in Mann's oeuvre could be the crucial argument of choosing this particular work as an inspiration for Barańczak's essay. The novel was written shortly after the publication of *Considerations of a nonpolitical man* [5], which means that Mann was working on it at the exact time of his paradigm shift.

In the article the comparison between Mann's change of political wievs and the moral dilemmas of the poets of the New Wave will be presented. Members of the poetic group relinquished modernistic ideas of poetry as an elitist art. Instead of such a view they began to think that literary works can provide a significant change in the attitude of its readers. Such a situation made it necessary to define one's political views.

Certain similarities between the situation of the artists of the New Wave and the case of Hans Castorp can be seen. Castorp was torn between supporting Naphta and being an adherent of Settembrini. Barańczak's reference to the dispute between the two antagonists from *The Magic Mountain* enabled the poet to thoroughly present his own dilemmas in a more subtle way.

Leon Naphta's evocativeness

Lodovico Settembrini appears in the novel sooner than Leon Naphta, whom the reader meets rather late, on a second volume of the novel, in a chapter titled „A new-comer". Such is the reader's first encounter with Settembrini:

„It appeared that the stranger, who might be about Settembrini's age, was a housemate of his, the other tenant of Lukacek the ladies' tailor. His name, so the young people understood, was Naphta. He was small and thin, clean-shaven, and of such piercing, one might almost see corrosive ugliness as fairly to astonish the cousins. Everything about him, was sharp: the hooked nose dominating his face, the narrow, pursed mouth, the thick, hevelled lenses of his glasses in their light flame, behind which were a pair of pale-grey eyes – even the silence he preserved, which suggested that when he broke it, his speech would be incisive and logical" [2].

Naphta is Settembrini's adversary. Their disputes inspire the protagonist, Hans Castorp, to define his worldview. What seems to be really interesting is Settembrini's attitude towards the young man – the Italian makes an attempt to protect Castorp from Naphta's adverse impact:

„I warn you. I cannot prevent you from cultivating the acquintance now it is made, if curiosity leads you to do so. But arm yourselves, arm your hearts and minds with suspicion, oppose him with a critical spirit. I will characterize this man for you with a single word. He is a voluptuary" [2].

One ought to deliberate on the differances between Castorp's interlocutors. The discrepancy between their sets of beliefs can be discussed by means of comparing Settembrini's and Naphta's attitude towards art. In *The Magic Mountain* such an opportunity is provided by the presence of a memorable sculpture, which is discussed by the characters in detail. The sculpture features a Baroque-style pieta capturing the misery of the Mother of God in an extremely realistical manner.

The sculpture riveting Castorp's attention can be found in Naphta's room. Hans seems to be in a quandary whether he amirers this piece of art or nor. He has an avertion to realistically depicted anguish which makes the scuplture rather repulsive. On the other hand, he discerns its enigmatic beauty. The magnificent influence of the pieta is explained by Naphta in the following terms:

„All works of art. whose function it is to express the soul and the emotions are always so ugly as to be beautiful, and so beautiful as to be ugly. That is a law. Their beauty is not fleshly beauty, which is merely insipid – but the beauty of the spirit. Moreover, physical beauty is an abstraction. Only the inner beauty, the beauty of religious expression, has any actuality" [2].

Naphta's admiration for the pieta is interrupted by Settembrini's arrival, which seems to be motivated in Lodovico's concern about Castorp and his unwillingness to leave the young man and Naphta alone. Settembrini does not share his interlocutor's admiration for the sculpture. Contrarily, he avoids looking at the pieta. It is not the realism of the sculpture that turns him off – Settembrini wants to show his resistance towards gloryfing the times of human cruelty:

„And you know, too, what inhuman atrocities, what murderous intolerance were displayed by the century to which the production behind me owes its birth. Look at that monstrous type, the inquisitor – for instance, the sanguinary figure of Conrad von Marburg – and his infamous zeal in the persecution of everything that stood in the way of supernatural domination!" [2].

Naphta repels such arguments because he is a staunch supporter of wars, believing that even though they bring misery, such suffering is compensated with the possibility of making progress. The Jesuit firmly believes that spiritual and technological development of the mankind is worth suffering a massive loss in population. Inflicting pain on other people is amply justified provided that it contributes to the good cause: „All the pains of the Church, even the stake, even excommunication, were inflicted to save the soul from everlasting damnation – which cannot be said of the mania for destruction displayed by the Jacobins [2]. Naphta goes as far as to say: 'Liberation and development of the individual are not the key to our age, they are not what our age demands. What it needs, what it wrestles after, what it will create – is Terror" [2].

The Jesuit seems to be a reflection of Erich Fromm's observations made in *Escape from Freedom* [5], in which a memorable portrayal of 'authoritarian personality' is presented. The reference to Fromm's book in the present article is not an ahistorical malpractice because even though *The Magic Mountain* was written fifteen years before the publication of *Escape from Freedom*, Naphta corresponds to Fromm's diagnoses. The German philospoher pictures three types od sadistic tendencies: getting people addicted to oneself in order to have unlimited power above them, yearning for expoloating others, inflicting pain on other people and watching their anguish. From the dispute between Naphta and Settembrini the reader can conlude that the Jesuit coresponds to all the types presented in Fromm's book.

Unsound reality

One of the main subjects of the novel, namely an illness, and a possibility to use it as a methaphore could be another reason for choosing *The Magic Mountain* as an inspiration for the New Wave poets' debate enabling the artists to present their moral values. However, in this case not just a tuberculosis but rather an illness per se is the point of reference. Susan Sontag in *Illness as Metahor* [7] studies the case of tuberculosis and states that the cultural meaning of this particular illness elevates the afflicted. Such a meaning of an illness is not used by the New Wave poets. Conversely, by using metaphores conected with ailments they depict the reality which is far from being well and healthy.

For example, Barańczak in his essay *Show the tongue, please* written in 1974 (it is the text that precedes *The changed voice of Settembrini* in one of the selections of Barańczak's essays) describes the reality of the 70s as unhealthy and degenerated. It is the language

used for everyday communication that is unsound. As a consequence, literature, which imitates the reality, is also infected. Barańczak writes:

„Let's listen to the voice of Polish poetry from the last thirty years, just as does a psychiatrist by listening to his patient not only to get a grasp of what the afflicted suffers from, but also to be able to fathom out the diagnosis from indirect symptoms such as diction, intonation, figurativeness and syntax. We should also treat the voice of poetry as a complex of symptoms revealing the illness unintentionally" [8].

Barańczak points out that by examining the language of poetry one can make diagnosis of the real world. Imperfect language full of blatant falsehoods reflects badly on the unsound reality. New Wave's criticism of the language of communist Poland overfilled with official propaganda was also a hidden polemic with the previous generation and the poetics of a literary formation called 'Hybryda'. The biggest obstacle to overcome was immorality of the reality of communist Poland. This unrighteousness is depicted by Barańczak in the following terms:

„In conclusion, instead of making an exuse from all the oversimplifyings and inaccuracies (I am aware of the fact that they are gargantuan – as always whenever one wants to somehow put literature in order and make it more transparent), I would like to reference to one particular situation, which bears a striking resemblance to all the actions taken up by a literaty critic not only because of the term 'research' that can be found in both medical and literary discourse. So we have a doctor – in this particular case he is not a psychiatrist but rather a general practicioner. Getting insight into the patient's bowels is not always possible. However, sometimes just taking a closer look on the patient's tongue will go out. Unfortunately, a diagnosis made on such a basis can set out only some types of ailments: for example, by looking at one's tongue the doctor cannot make a diagnosis about the condition of one's spine. To see that the patient has hurt his back a detailed roentgenoscopy will be needed" [8].

Mann's paradigm shift during the First World War

While studying the case of Barańczak's essay it is essential to mention how *The Magic Mountain* came into being. Thomas Mann started working on the aforementioned novel in 1912, shortly after visiting his wife suffering from pulmonary disorder in a nursing home located in Davos. After 12 years of toil, the masterpiece was finally finished. That time also abounded in spates of unrest and upheaval induced by German military action connected with the First World War.

In 1914 Mann was a staunch supporter of German war politics. Hermann Kurzke points out that „Mann's attitude towards the First World War in the times of its outbreak is one of the biggest mysteries that have to be solved by a biographer who wants to write about the Nobel laureate" [9]. After that he also adds: „Mann's common sense finally had to lead him to becoming the antagonist of war" [9], probably having in mind the writer's acts against Nazi Germany which had an influential impact on the form of *Doctor Faustus* [10] and Mann's radio speeches broadcasted by BBC [11].

Mann's paradigm shift during the First World War can be observed in his monumental essay titled *Reflections of a Nonpolitical Man* in which he treats war as an essential German defence from the democratic countries of Triple Entente.

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Jacek Kępa, who translated a foreword to Mann's *Reflections of a Nonpolitical Man*, points out that within six hundred pages of the essay one can observe the writer's changing views. By writing the foreword at the end of his work on the essay, Mann created it in such a way that it sums up all his reflections presented in the book. Kępa summarises them as follows:

„Clear views that enabled the nonpolitical man to avoid losing face in the dispute with the 'civilization's literary man' are generalised to an attitude connected with one's beliefs, which means that one constantly has to mediate between two points of view that contradict one another: destructive tendency and a conservative one. The contradictory beliefs appear to actually be redeeming qualities to such an extent that it is almost impossible to make a choice. […] The only solution is to refrain from making ultimate declarations. The aim of the art is to find some kind of stability between the two worlds" [12].

The Magic Mountain was written when Mann's views were liable to change. Mann spoke about his paradigm shift in *Autobiographical Statement* from 1930:

„In 1913 the novella *Der Tod in Venedig* [*Death in Venice*] was published, which beside *Tonio Kroger* is considered my most valid achievement in that genre. While I was writing its final sections I conceived the idea of the "Bildungsroman" *Der Zauberberg* (1924) [*The Magic Mountain*], but work on it was interrupted in the very beginning by the war. Although the war did not make any immediate demands on me physically, while it lasted it put a complete stop to my artistic activity because it forced me into an agonizing reappraisal of my fundamental assumptions, a human and intellectual self-inquiry that found its condensation in *Betrachtungen eines Unpolitischen* [*Reflections of an Unpolitical Man*], published in 1918. Its subject is the personally accented problem of being German, the political problem, treated in the spirit of a polemical conservatism that underwent many revisions as life went on" [13].

A confession mentioned above shows that had Mann not worked on *Reflections of a Nonpolitical Man*, ideas presented in *The Magic Mountain* would have been different. It is possible that the necessity to set out his political views was reflected in Hans Castorp being torn between Naphta and Settembrini. Castorp's dilemmas seem to be really credible, enabling readers to identify with him to some extent:

„The protagonist of *The Magic Mountain* is not an outstanding mind or a distinguished inventor, but Mann's humanness made Castorp's history relevant to all people; sprawling small individual histories into matters of the great importance is what constructs the epicness of *The Magic Mountain*" [14].

It is worth mentioning that the first person trying to have an impact on Hans Castorp's views is Settembrini. Set of beliefs presented by him seems to be similar to the one criticised in Mann's *Reflections of a Nonpolitical Man*:

„Two principles, according to the Settembrinian cosmogony, were in perpetual conflict for possesion of the world: force and justice, tyranny and freedom, superstition and knowledge, the law of permanence and the law of change, of ceaseless fermentation issuing in progress. One might call the first the Asiatic, the second the European principle; for Europe was the theatre of rebellion, the sphere of intellectual discrimination and transforming activity, whereas the East embodied the conception of quiesence and immobility. There was no doubt

as to which of the two would finally triumph: it would be the power of enlightenment, the power that made for rational advance and development. […] Then only the day would come when thrones would crash and outworn religious crumble, in those remaining countries of Europe which had not already enjoyed the blessings of eighteenth-century enlightenment, not yet of an upheaval like 1789" [2].

Naphta appears in *The Magic Mountain* as Settembrini's opponent. Castorp is given a chance to listen to their disputes and to reconsider his own set of beliefs.

A struggle for Hans Castorp's soul

What is the connection between Castorp's quandaries and the situation of the New Wave poets? Presenting dilemmas important to artists living in communist Poland (an absolute necessity to take sides in the conflict between the socialist government and an individual man) by the use of Castorp's story enabled Barańczak to avoid two fundamental undesirable effects: cenzorship and an impression of excessive moralizing. Artur Nowaczewski points out that Barańczak's speculation on *The Magic Mountain* is an example of aesopian language which conceals the real subject matter on the pretext of pondering on literary issues [15].

Becoming a supporter of the weaker character, namely Settembrini, is tantamount to being a supporter of an individual man's interest. However, Barańczak is aware of the fact that his views about literature probably are just a wishful thinking – it is possible that poetry changes the state slightly, but it is unable to have a discernible impact on how the authorities treat people.

Barańczak also experiences a paradigm shift – he had to dispel his illusions of the government being fair. In 1970 he writes his manifesto *A few assumptions on the contemporary poetry* in which he postulates creating such a poetry that it encourages the readers to think independently and suspiciously towards all the authorities. Barańczak points out that he does not believe in poetry changing the world completely but it is not beyond the bounds of possibility that it might contibute to people asserting their rights, which, at the end of the day, will result in holding back hypocrisy and demagoguery.

It is worth underlining that Barańczak puts his faith mostly in intelligentsia and all the people capable of critical thinking, believing that they might have a great impact on the reality. He writes:

„Poetry – as we all know – does not have a lot of influence on the people today. However, it can be a 'nomial capital' and provide a Chance to spur people on to change the reality. It is possible to render poetry the first outpost in a battle over not-distorted image of the reality we live in. Poetry does not reach out to a coach potato sitting in front of TV or flicking through some magazines. Reversely, it is adressed to those who apparently want to think – that is why they oppened the book anyway" [16].

In the aforementioned quote Barańczak emphasizes the importance of independent thinking, thereby excluding those blindly following the government propaganda from the group of people capable of changing the reality. The aforementioned statement means that the latter group ought to shoulder the burden of the fight for the fundamental human rights. In *The changed voice of Settembrini* written in 1975 Barańczak puts forward his own idea of creating a more effective

way of interpersonal cooperation, grounded on newly established ethics rescpecful of all human rights regardless of one's views, skin colour, age etc.

Such a demand is seen by Lidia Burska [17] as an effort to dismantle the socialistic utopia. The scholar highlights the vastitude of young people's enthusiasm which stems from realising that the current reality is full of lies and a from desire to create new reality. Burska writes:

„The New Wave poets' thinking about the liberation of a 'man in the street' features utopian hopefulness characteristic of intelligentsia's paternalism. It envinces itself in acceptance of mass culture providing that it opens up to contents and patterns characteristic to intelligentsia, beacuse it is the only way of it being worthwile" [17].

However, Burska discerns differances in the New Wave poets' viewpoints and she attributes the symptoms of a change to the dispute about *The Magic Mountain*:

„Even though rhetoric and some arguments are similar to those from *The suspicious and the self-righteous*, the overall point is different. The aforementioned declaration is a testimony of a break up with illusions about the possibility to remedy the system. Socialism and Marxism are seen as an utopia unworthy of sacrifice, because historic profit is made at the cost of thousands of lives. Therefore, *The changed voice of Settembrini* is the first couched in unequivocal terms generational idea of overstepping the boundaries of socialistic utopia" [17].

Barańczak's paradigm shift in the mid-70's bears some resemblance to the case of Thomas Mann who had to verify his viewpoint. Both the writers have changed their views after the confrontation with totalitarian systems. They were aware of the fact that the reality suprassed all the expectations and pushed all boundaries by heightening the incidence of violence and treating people unfairly.

However, it is worth underlying that Mann's case was more dangerous, because there was no possibility for him to live in nazi Germany and still be a prolific writer. Communistic Poland seriously restricted the rights of the people living in this country, but also tolerated the presence of artists and sometimes even allured them by providing lavish scholarships and enabling them to publish their works. Nevertheless, a comparison between the two writers can be made.

Barańczak, just as did Thomas Mann, realised that all the people have indispensable human laws. The novelist underwent a major change − from being a supporter of monarchy to becoming a symphatiser of democratic endeavours, whereas the poet had to face the fact that people had already stopped believing all kinds of authorities. Instead of the ethics grounded on the authorities whose words people no longer trusted, Barańczak insists on creating a new system on values stemming from recpect to human laws:

„It is the literature, especially poetry, that has to realise the consequences of the God's death (or, rather the death of all gods, beacuse it is all about the distrust towards the authorities, understandable in the light of the 20th century ecperience of too many irrational mass hypnosis alleging gods in self-justification for hypocrisy and felonies, rather than about a religious problem). Literauture is able to – and ought to – create a new decalogue. Such a decalogue that does not support any irrational authorities and which itself is not a source of authoritarian way of thinking, universal formula or dogmatic norm" [4].

Just as Hans Castorp did, Barańczak experienced a necessity of setting down which standpoint bears the greatest resemblance to his own. He could have chosen between a conformist attitude which offers peace and quiet but at the price of constant self-decepting (it corresponds to Naphta's authoritarian viewpoint) and a protest against the reality of communist Poland leading to respect towards fundamental human laws (Settembrini's ideas are close to such an attitude). Barańczak chose the latter, not only in his literary works but also in his private life – his opposition activity, which led to Barańczak being fired from his work at Adam Mickiewicz University in 1976, can serve as an example of such a stance.

The reference to Mann's *The Magic Mountain* and the dispute between Naphta and Settembrini enabled Barańczak to avoid writing about the current reality point-blank.

Summary

Matters specified in the present article enable one to have a closer insight into one of the most important literary disputes in communist Poland. The discussion between the New Wave poets inspired by *The Magic Mountain* relates to the case of a poet living in a degenerated, unsound reality. Such circumstances deprive Barańczak of the possibility to express his ideas directly, so the poet references to Mann's novel in order to highlight the importance of independent thinking and taking up actions aiming to change the reality.

Choosing *The Magic Mountain* as an inspiration for Barańczak's essay could have been a deliberate decision to draw attention to that particular book, which is significant to understanding Mann's paradigm shift. The novel was written in the times of important historical events, which lead to Mann reconsidering his set of beliefs. The writer realised that the victory of the countries forming Triple Entente was imminent and it had to trigger a substantial change in political systems, namely a transition from monarchy to democracy.

Analysing *The changed voice of Settembrini* is essential to understanding the dilemmas faced by the poets in communist Poland. This article aims at highlighting the importance of Barańczak's essay, which is also a great testimony of the significance of *The Magic Mountain*.

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FATHER WENANTY KATARZYNIEC'S PATH TO HOLINESS

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Abstract:

Father Wenanty Katarzyniec, the Servant of God, is becoming more and more known in Poland as an effective advocate. More and more people are praying for his intercession and making pilgrimages to his grave in Kalwaria Pacławska. There are also more and more publications about him. The aim of this article is to present in a very synthetic way the figure of Father Wenanty, his desire for God and the path to holiness. Using personal notes, testimonies about Wenanty and publications about him, the author introduces the reader into the various stages of Józef Katarzyniec's life and shows how at every stage of the path to holiness his spiritual growth took place. God's great thirst, priesthood ministry, struggling with himself, and great humility, obedience and zeal have led Father Wenanty to live in holiness in less than 32 years.

Keywords:

Wenanty Katarzyniec, Franciscan, priest, holiness,

Introduction

Józef Katarzyniec – Father Wenanty, now a Servant of God, lived nearly 32 years. However, this short life was filled with love for God, full of dedication and intense service. He is called the Polish Charbel [1], because his intercession with God obtains for many people all his graces, which are necessary in everyday life.

This article is intended to present the life of a young monk, through his desires for priesthood and holiness, through his loyalty to God in every slight event and the undertaken activity.

The model of holiness carried out by Father Wenanty may not be fully understood by the contemporary reader. Nevertheless, we can find many thoughts and practical ways in his life and spiritual considerations that will help us to come closer to God. This article is an incentive to look deeply at a man, who did not try to do extraordinary deeds, but he did ordinary deeds in extraordinary way. For this, his activity after death - in accordance with the promise of Wenanty himself and numerous testimonies of the faithful - became extraordinary [1, 2].

A clear purpose of life - the first steps on the path to holiness

Józef Katarzyniec was born on October 7, 1889 in Obydwo, a small town near Lviv. His parents Jan and Agnieszka were poor people living on a small farm. Jan Katarzyniec also worked as a sewer to improve the family budget [1]. Józef's parents were combined in deep

devotion and mutual love. A. Wojtczak, describing the marriage of Katarzyńcy, wrote that many neighbors remembered that on Sunday after the church service Jan and his wife were still in the church and prayed for a long time. However, nobody remembered that they would ever argue or be the cause of any disputes or disagreements [3].

Józef was baptized on October 13, 1889 in the parish church in Kamionka Strumiłowa. The godparents were Daniel Władyczka and Katarzyna Mazur [4]. His childhood was ordinary and very similar to childhood, which all other rural children had. From the age of four he helped to pasture geese on the farm, and when he grew up he used to pasture cows. Apart from work on the farm, Józef was also intensely involved in religious life. Even as a small child, together with his mother, he would pray the rosary, even several times a day. This practice of praying the rosary also accompanied him later, when he pastured geese or cows. Not only did he pray for himself, but he encouraged his friends to pray. Although he was a quiet, praying child, he tried to participate in children's games, but without special enthusiasm. He never joined children when they went to steal food, peep each other, or when they beat each other. While pasturing gees or cows during he was able to find somebody to fill in, he went to a nearby shrine and prayed there. When he came back, he encouraged others to pray the rosary, and he encouraged even to those who planned evil intentions, he held sermons in which he reminded them that God would punish people who would do evil [3]. It may seem that, in the face of such specific behaviors, children will avoid it. However, it was quite the opposite. He was accepted and even listened to by his peers.

At the age of seven, he began studying at a two-class school in Obydów. His education was very good, he was a concerned and disciplined student. In 1898 he received the first Holy Communion. The time of preparation for the Eucharist sacrament was for him a time of deepening his spirituality. He even prayed more often and stayed in solitude. After receiving the First Holy Communion for the first time he prayed for a long time and people should had intervened him in order to he go home [4]. Then, for the first time he told his parents that he wanted to become a priest.

From the next school year, he began attending a school in Kamionka Strumiłowa, four kilometers away from Obydów. At that time, he tried to serve Mass every day and he received the Holy Communion. He was an ambitious student, and because he did not have good conditions to learn at home, he was found in a forest studying or preparing for lessons for the next day [3]. In addition to the liturgical service at the Altar, Józek prepared the liturgical vestments, which were cut from paper and he celebrated "masses" in the small building next to his house which were attended by his friends. His father, who was concerned by this fact, forbade his son such fun, and also went to the local parish priest for advice. The parish priest, having learned what the "mass" looked like, decided that Jan Kaczyniec could allow his son to do these pious games.

The school in Kamionka Strumiłowa lasted only five years and he had to go to Lviv or Radziechów for further education. The Katarzyńcowie, due to their poverty, could afford to pay for their son's education, which generated lower costs. This was the reason why they chose Radziechów, where Józef began education in the third grade at the department school, which also prepared students for the teacher's seminar. The Katarzyńcowie hoped that the son would become a teacher in the future and in this way he would earn his living and help his family. At least, at the time, Józef

was convinced by this argument, but he still wanted to become a priest.

That is how he started the next stage of education and preparation for the priesthood. He also demonstrated studiousness and diligence in learning. He also helped many of his friends, who had problems with the acquisition of knowledge. The head teacher of the school gave him books lying in the attic, because of good marks and eager devotion. Józef could choose the ones he wanted. One of the books that he liked so much was the Catechism of the Council of Trent. Józef found many tips on how to lead his spiritual life. He spent the holidays at home and even then the desire to pray in solitude, calm down and avoiding playing with his peers was more and more visible.

Józef started his next stage of education in 1907 in the male teacher's seminar in Lviv. Although Józef received a scholarship and was supported partly by his parents, and he made some money by giving private lessons, financial difficulties were his constant concern. When he was in the teacher's seminary, Józef knocked on the conventual door of Conventual Franciscans in Lviv. However, he was not admitted to the order at that time. The Provincial superior recommended him to learn Latin for the next year. He graduated from high school and passed the Matura exam [4]. Józef did not become discouraged by the provincial's refusal, but he gritted his teeth and started to learn. A year later, he approached to the Provincial with his secondary school certificate, who was amazed at his grades, as well as the level of Latin language skills achieved only during the year [4]. In this way, Józef Katarzyniec was admitted to the order. The situation illustrating how much the desire for God's service filled Joseph's heart. He was opposed to parents, who wanted their son to become a teacher and not a priest. Despite the arguments relating to the love of parents and gratitude for them also for education, Józef remained strong-minded. God's will was more important to him than his parents' will.

Saint in the novitiate - humility and obedience

The novitiate Józef Katarzyniec started with retreat together with other candidates. The notes he drew up at that time are a testimony of how he experienced his relationship with God. Even though they often contained the thoughts of others, they indicate what was important to him [1]. He wrote that we should strive for perfection not slowly, but at full speed. According to Wenanty, a monk will be useless in the house of God without zeal, so he will be like a lamp without oil [5]. Humility and the awareness of your dependence on God must be at the heart of the pursuit of holiness. However, this way also implies the fight against self-discouragement. And Józef already knew about it at the beginning of his religious life [5]. According to Józef, a special meaning in the religious prayer should be the adoration of the Blessed Sacrament. He noted then that without the worship for the Blessed Sacrament, the life of a monk will disappear, because the Eucharist is an extraordinary revelation of the love of the Lord Jesus Christ and He is our life [5]. In accordance with the religious laws on the last day of the retreat, Józef made a general confession. On the following day he accepted the religious habit, signifying the acceptance of the will and election of God, and the name of Wenanty.

In the novitiate, Wenanty developed humility and obedience. The religious asceticism, which he zealously practiced, concerned not only severe austerities, but also minor mortifications of superiors and confreres, and it even concerned accepting false accusations [1]. This is evidenced by

the words written in the notes to worry about when the will of the superiors requires it and bear the exasperated pleas of God [5].

However, the most important element of Wenanty's life was a prayer. He prayed a lot and he often came to the choir of the novitiate and he encouraged others to pray. The confreres saw his inner focus and devotion during their common prayers. He also showed great devotion to a prayer in his notes. We can read in them, among others, such words: "Who is not a supporter of prayer and inner concentration, that he will never come to a complete victory over yourself or to any degree of perfection [5]. This persistence in prayer allowed him to stick to the purpose, which was the service to God. He also fought persistently with frigidity and with discouragement that could sneak into his life. In his notes we can read such a task: "It is a great evil in spiritual life to disregard small things", which he reflected in his behavior trying to keep the rules and avoid the slightest sins or neglect the slightest mortifications [1].

The spiritual battle of Wenanty did not go without a problem. He had to deal with his natural loneliness and adapt to the community of brothers. Another difficulty in the novitiate was the issue of purity. We learn about concentrating on the fight for purity from his notes. We find in them the care of the senses and resolutions to protect them: "I must protect my senses: my eyesight - that I do not see too much, listen – that I do not hear something immodest, my touch - because if it is not guarded, it may expose me to great dangers" [5].

Wenanty supported his concern about his own salvation and sanctification by the contemplation of eternity, and especially about the day of his death, which even today seem to be very practical. He reminded to treat every day like the one who would be his last. "Am I sure that I will wait until tomorrow? Oh, how I am improvident!"- he wrote in his notes. "Until today, I did not care much for the glory of God and for my own salvation; I can not fix it anymore what already happened. I am not sure tomorrow, but I can manage that days, which is now. The time we live in is as expensive as heaven, like the Holy Blood of the Lord Jesus, as God Himself, "we read further.

When the various internal difficulties were already beyond him, Wenanty was grateful to God for the experiences that strengthened him in his faith and in his vocation. He wondered, however, what is provided by the peace of the human soul and what he has in his religious life to serve interior peace. Wenanty came to the conclusion that he should pay attention to three main things every morning. The first one concerned the purpose of his life - he is to serve only God, and all his efforts are to serve God in order to please him. Therefore, the first thought that should accompany him was to be: "I should consecrate my day to God for glory and for work on the salvation of my soul". It was a matter of constant awareness of the end of life and responsibility for one's own actions. Thus, the second thought was: "Maybe this day will be the last for me." The third issue, however, concerned the great value of the time". Therefore, the third thought was: "Do not lose the smallest opportunity for good" and the decision to sigh before each, especially important activity: "My God, I offer this activity for your glory" [3, 6]. This way of starting each day carried over the entire subsequent life of Wenanty. The thoughts allow to understand its incredible accuracy and diligence in even the smallest activities and its constant memory of God's presence.

On September 26, 1909, Wenanty completed his novitiate and took religious vows at the hands of the Provincial Father Peregryn Haczela. A few days later, together with other brothers, he moved

to Cracow to begin his philosophical and theological studies preparing for the priest's ordination.

Deepening the relationship with God - the time of preparation for the priesthood

The time of studies in Cracow highlighted all the features of Father Wenanty Katarzyniec's sanctity and his path to God. From the very beginning, Father Wenanty attached great importance to study, putting all his zeal and diligence in it. Then, it turned out that he is one of the most hard-working and the most talented students. His professors perceived this commitment and they gave him voice in disputes and they commissioned him lectures and lectures [7]. When his confreres were resting, he was constantly reading and studying, making comprehensive notes. He also eagerly shared the knowledge, which he gained. He never refused to help learning when someone asked for it. At the same time, he tried to avoid any situations that would vilipended the confrere he helped. His humility and love towards his brothers also appeared during lectures. When one of the professors asked a question that none of the students could answer, Wenanty never answered, even though he knew the answer. In his opinion, it would be an expression of self-love seeking praise [3].

One of the spiritual readings during his studies, which was commissioned by his father confessor, was a small book "The Imitation of Christ" by Thomas à Kempis [8]. It made an indelible impression on the cleric Wenanty. Virtually every of poems was accompanied by a commentary by Wenanty, who tried to realize the instructions of the 14th century monk in the 20th century. Spiritual work of Wenanty was not limited only to notes, but translated into specific provisions to be implemented on a daily basis. Father Wenanty had an inexhaustible energy to thoroughly fulfill what he had decided. This indicates an incredible spiritual strength, perseverance and great courage in dealing with the imperfection of his own nature and in renouncing everything that does not lead to God [6].

Another important reading for Father Wenanty was "The Treatise on a True Devotion to the Blessed Virgin Mary" by Luis Maria Grignion de Monfort [9, 13]. Marian devotion was nothing new for him because he was a propagator of the Rosary prayer from early childhood. Now, however, it was important to confide himself to the protection of Mary and the service to God along the lines of the Blessed Mother of God.

It is significant that the Father Wenanty was already described by Father Czesław Kellar, his confessor and later the master of clerics, as the *Martyr Venanty.* In fact, the whole life of a young religious was imbued with a heroic struggle with everyday life. At least four levels of heroism could be seen. The first is the martyrdom of completing the smallest religious regulations. From the very beginning of his religious life, he chose this way to holiness. Wenanty was aware that he would have no opportunity to extraordinary heroic deeds and the path of fidelity and accurate fulfillment of his daily duties was as accessible to him as possible. Then, he was very pleased when during the retreat directed by Fr Marian Sobolewski, he heard: "If we keep all the religious rules and regulations, we can be sure of holiness" [6]. These words confirmed that he had made the right choice. His fidelity and diligence in fulfilling religious orders were confirmed by his confreres who observed his life every day.

The next level was his persistent work, the fruits of which could be seen in his results, but also testimonies of confreres who had never seen Wenanty inactive. He always read, learned or wrote

something. Even during the clerical holidays at Kalwaria Pacławska, when it was time to relax, he was seen studying some kind of reading. Czesław Kellar wrote about him that "He never lost time" [1]. If it turned out that the programme of studies did not envisage the content important for Wenanty, he undertook an additional work to get acquainted with it [3].

The third plane of Wenanty's heroic life was the humble fulfillment of mortifications. These were the mortifications of his own body, often only available to Wenanty himself. From his notes, we can learn that the mortifications were to have a practical character [1]. Therefore, in the smallest activities, such as eating meals, he mortified his body by eating everything what he gave and if he tasted some meal, he ate less of it. On the other hand, there were also mortifications hat the confreres saw. Their testimonies indicate, among others, that Father Wenanty practiced absolute poverty, which was one of his most frequent mortifications [3]. Even later, when he was raising newcomers himself, he did not have any unnecessary things in his room.

The last plane, but very important in the religious vocation is the cross of community life. Especially the last one was quite a challenge for Wenanty. His solitary life, which he led in the first religious years due to the constant struggle with his own nature, changed radically. Father Wenanty was able to joke with others, he was involved in performances, he became involved in jokes and games, he enjoyed summer holidays as well as other clerics. He always helped everyone, who asked him for something.

The effort of constant care to stay in God's presence helped him in his heroic life. Every hour he wandered to the monastic chapel for a moment of adoration, but every fifteen minutes he kneeled at the table where he worked and prayed for a while. According to Wenanty, there were three ways to practice God's presence: in all activities we should first appear before God, then we should remember his presence by means of signs and things, and we should acknowledge God's Providence in all personal and world events [3].

Father Wenanty proved his full of devotion and love for Christ taking perpetual vows on December 8, 1912 in the Franciscan church in Cracow. However, one and a half year later he received the desired priesthood, to which he eagerly and diligently prepared himself for five years of study. By the decision of his superiors, after a previous dispensation, he was ordained a year earlier. On June 2, 1914, he was ordained as a priest at the hands of Bishop Nowak. The greatest dream of his life finally came true.

Even closer to God - priestly service

The first years of the priesthood of Father Wenanty coincided with the time when there was the fog of war. He was unable to return to Cracow for the last year of theology, so he was directed by the decision of his superiors as a vicar to the Czyszki parish, a town 16 km away from Lviv. Father Wenanty was known as a zealous priest, a great preacher and catechist, and a great confessor. Therefore, the news of the new vicar spread very quickly in the parish. There was a lot of pastoral work, especially since the other two fathers were already older. Daily ministry in the confessional, Eucharist, preaching, preparation of the faithful to other sacraments, but also preparation of a large group of children for the first Holy Communion, as well as in administering the sacrament of the anointing of the sick, sometimes in distant corners of the parish - the sick who also suffered from

infectious diseases. Father Wenanty was not afraid of any priestly duties and never avoided them. Father Karol Olbrycht, Pastor of the parish, gave him a very flattering opinion: "He fulfilled his duties with pleasure, he was punctually, and that he was talented and he never lost time, so he was so practical and knew how to know that I did not happen that I should ever need to draw attention to the impropriety of the proceedings, or to educate him in anything, unless he has asked me for an explanation of what should he do in a given case" [10].

The integrity of the person of Father Wenanty was evident in the incredible ability to combine long-term pastoral work, community life and personal concern for time for prayer. His love for the confreres, who were still a lot older than him, urged him to learn to play bridge, so that he could spend time with them [11].

Eleventh priestly ministry of Father Wenanty in Czyszki ended in August 1915 with a move to Lviv. Father Marian Sobolewski, then the Franciscan Provincial, appointed him as a novitiate's master, because of staff shortages, even though Father Wenanty did not have the necessary age and apprenticeship of religious life. Father Wenanty, in obedience, accepted the decision of his superior and, with all his eagerness and diligence, he started to fulfil the task entrusted to him. He shaped novices according to what he lived. His warmth, but also the requirements of the novices were supported primarily by his own example, from which his learners drew the most. Therefore, not only teachings addressed to novices, but the testimony of personal adherence to God gave the tone of his educational work. In addition to being a novitiate's master, he was also nominated a prefect of friars. The spiritual care that Father Wenanty exercised over them was very simple and practical. In contact with the brothers, he was very warm-hearted and careful that none of them felt less important.

Work inside the community was only part of the duties that were successively imposed on him. Father Wenanty regularly gave sermons at the Franciscan church in Lviv and he heard confessions, served the Sisters of the Franciscan Family of the Virgin Mary, and also served in a disabled institution run by the Sisters of St. Joseph. No one has ever heard any his complaints about too many duties or overwork. Each work commissioned by his superiors was for him a service of love for God and his neighbour. The principles of Father Wenanty, which he had lived since the beginning of the monastic life and which he taught his pupils, now were even more reflected in life and ministry. He believed that one should not stint the time for God, and a large amount of work is an advantage, because thanks to it one can gain more merit with God.

Enormous amounts of work and ascetic life depleted Father Wenanty from year to year. His last years were marked by tuberculosis. Despite the intervention of the superiors, who sought to relieve Father Wenanty reducing his scope of work and guiding him to a rest at Hanaczów, the disease progressed. He spent the last time in the monastery in Kalwaria Pacławska. Also here, on the measure of his strength, he undertook pastoral work. He wrote letters to people he could not personally lead in spiritual direction. Father Jakub, who took care of him, remembered him: "He endured the disease without murmuring, he never showed any shadow of impatience or complaining. He never complained about anything if there were any shortcomings. He did not criticize anything and criticize anyone, but in his sufferings he was always quiet and calm, showing everyone his heartfelt gratitude for the service" [6].

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Father Wenanty died on March 31, 1921 in Kalwaria Pacławska. A funeral was held on 2 April. On 27 June 1950 in the bishop's curia in Przemyśl, the information process about Father Wenanty Katarzyniec began, and on August 16, the body was exhumed and placed in the cloister of the church in Kalwaria Pacławska. On April 26, 2016, Pope Francis gives permission for the publication of the decree on the heroic virtue of Father Wenanty. Only the miracle that was asked through the intercession of the Servant of God divides us from proclamation him of being blessed.

Conclusion

The spiritual path of the Servant of God, Father Wenanty Katarzyniec, is also called "a small path" [12]. There were no extraordinary events in his life. These were just beginning to happen after his death. His life was simple, but marked by the heroic implementation of Christian life. Let this brief introduction to the life and thought of the Servant of God Father Wenanty Katarzyniec to be an incentive for the reader to broaden knowledge about him, and to pray for his intercession, finding in him an effective advocate.

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ESTIMATORS FOR RULE QUALITY ASSESSMENT IN ANFIS SYSTEM

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Abstract:

Machine learning yields outstanding results when it comes to learning patterns in data sets. Yet it is often difficult to extract relationships that create learnt patterns, especially from neural networks systems. However there exist approaches as ANFIS that allow to learn data and interpret learned knowledge in a form of logic rules.

The article presents two estimators that allow to evaluate each rule in the system, what in future can lead to a major improvement of computational complexity during ANFIS learning. The idea of evaluating only one rule in ANFIS system is a novelty and no literature on the subject was found. Both estimators were compared on artificially generated dataset, with different configurations of ANFIS system.

Presented estimators allow to identify which rule can be improved by increasing the number of linguistic values. The rule evaluation can help improve ANFIS in terms of lowering the number of rules thus lowering the computational complexity, which is currently its major drawback – so called dimensionality explosion.

Keywords:

machine learning, ANFIS, neuro-fuzzy

Introduction

Machine learning is nowadays and omnipresent technology. In the age of information every branch of science can generate a vast amount of data, overwhelming for humans to process and analyze. Obviously, people can process big datasets with a use of algorithms, however usually there is no clue on what pattern is present in the data, if any. In such cases the machine learning (ML) is able to find patterns in huge datasets and it often outperform humans [1, 2].

The most popular ML methods are neural networks (NN), which can analyze huge, almost unprocessed datasets with reliable results. NNs became more popular as the computing power became cheaper. In order to learn a NN much computation must be made. Once learned, NNs can generate predictions for new observations much quicker than during learning process.

NNs have many advantages such as good learning capabilities and efficient mechanisms for overfitting prevention, what results in wide range of applications. However, as many suggests [3, 4] this trend can soon become a problem – the main disadvantages of NN is that it is often very

difficult or even impossible to reveal what exactly a NN have learned. Once learnt it is a black box, that performs well on validation set, but one cannot be sure what features of object determines the output.

Thus, trends might turn toward methods that allow to decipher/extract learned patterns. One of ML's methods that provides such capability is a neuro-fuzzy (NF) system that combines neural networks and fuzzy logic. The learning and structure are similar to NN, but the patterns are encoded with use of fuzzy logic. NF systems use interpretable IF-THEN rules, which can be easily understood by humans. It gives a possibility to enumerate and assess patterns found by ML system. Human can verify if the system yields a set of reasonable rules or if some of them are a result of noise or bias in the training data. Moreover, some of them can be fixed during learning process.

However, NF systems are still far behind NNs as they learn slower while consuming the same or more processing power. This drawback gives an opportunity to explore more efficient methods in NF systems that would learn faster and use less computer power.

Literature review

The Adaptive-Network-Based Fuzzy Inference System (ANFIS) was proposed in 1993 by Sing and Jang [5] as a hybrid of neural networks and fuzzy logic. Fuzzy rules are encoded in a form of nodes arranged as layers. The system can be scalable in terms of number of inputs, and each input can be represented by many linguistic values.

The ANFIS system was applied to many fields such as image processing [6-8], material engineering [9], mechanics [10], software engineering [11] and medicine [12].

Computational complexity is one of its greatest drawbacks however there is only a few proposals for improvements, e.g. it can work faster if it is implemented on field-programmable gate array [7].

Another common modification of ANFIS system involves optimization algorithms. Application of genetic algorithms (ANFIS-GA) to optimize system parameters results in finding better solution, in comparison with standard implementation of ANFIS [13, 14]. Also implementation of particle swarm optimization [14, 15] produces even better outcomes, than regular ANFIS and ANFIS-GA.

The quality of ANFIS learning process is usually assessed as many other machine learning systems [14]. No examples of individual rule quality analysis were found. The issue was an inspiration for the presented paper.

Materials and methods

In order to assess the learning quality a custom implementation of ANFIS was implemented that allows to include changes in structure of system. To evaluate the quality of rules, methods for rules assessment were developed and described with details in section:

Estimators of learning quality.

ANFIS implementation

The ANFIS system was implemented in Python programming language. In Fig. 1 the example of structure of ANFIS is presented as a diagram. Presented system has two linguistic variables (inputs) x_1 and x_2. Each variable has 2 linguistic values (indexed by i) and the total number of rules in the system is also 2. Rules are indexed by j.
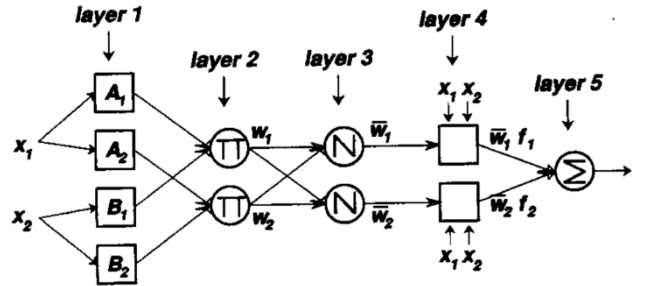

Fig. 1. Rules encoded in ANFIS system
Source: [5]

Functions of layers in ANFIS system:

- Layer 1 – Values of linguistic variables are transformed to linguistic values (fuzzy values). Each variable can be described in two forms, for example variable x_1 can be represented by linguistic value A1 or A2. The layer is responsible for fuzzification of inputs. Trapezoidal membership functions (1) were used for fuzzification and were restricted by the *partition of unity*. Membership function assigns a number from the range of $< 0, 1 >$ for each value of linguistic variable. The assigned number indicates the degree of membership of the value to linguistic value.

$$\mu_{A_i}(x) = \begin{cases} 0 & x < a_i \\ \frac{x-a_i}{b_i-a_i} & a_i \leq x < b_i \\ 1 & b_i \leq x < c_i \quad i = 1, 2. \\ \frac{d_i-x}{d_i-c_i} & c_i \leq x < d_i \\ 0 & d_i \leq x \end{cases} \tag{1}$$

Each trapezoidal function has four parameters $\{a_i, b_i, c_i, d_i\}$, which undergo optimization during learning.

- Layer 2 – finds firing strength for each rule by use of conjunction operator, which is usually implemented as a product of membership functions values.

$$O_{2j} = \mu_{A_i}(x) * \mu_{B_i}(x) \quad i = 1, 2. \tag{2}$$

Where O_{2j} is output value of the node.

- Layer 3 – normalizes the firing strength of every rule, what means that each output of previous layer is divided by the sum of outputs of previous layer.

$$O_{3j} = \frac{O_{2j}}{\sum_k O_{2k}} \quad j = 1, 2. \tag{3}$$

- Layer 4 – determines conclusions by multiplication of input vector X and vector of conclusions parameters $Z_j = \{z_{j0}, z_{j1}, z_{j2}\}$. Then the values in resulting vector are summed up, and the sum is multiplicated by normalized firing strength (output of layer 3).

$$O_{4j} = O_{3j}Z_jX = O_{3j}(z_{j0} + z_{j1}x_1 + z_{j2}x_2) \qquad j = 1, 2. \qquad (4)$$

Conclusion parameters undergo optimization during learning.

- Layer 5 – all outputs are summed up as the output of the system f.

$$O_5 = f = \sum_j O_{3j}Z_jX \qquad (5)$$

The learning process is performed through optimization of premise and conclusion parameters for a given training set. The optimized function is given with equation (6).

$$f_{cost\,function} = \sum_k |f_k - y_k| \qquad (6)$$

Where k is an index of each sample in training set, f_k is system output for sample k and y_k is the label of *k*-th sample. The optimization is performed with *basin-hopping* algorithm and SciPy library [16]. It performs global optimization, so the result is not strongly dependent on initial values.

Finally, the described ANFIS system was learned on a PC with 64-bit Windows 10 PRO system, equipped with Intel Core i5 processor and 32GB of RAM memory.

Estimators of learning quality

Two types of rules' estimators were analyzed. First one uses primary component analysis (PCA) [17] to evaluate the quality of a rule and was named *estimator 1* (E1). The goal of second estimator is to assess the accuracy. It is based on the number of correctly labeled samples and was named *estimator 2* (E2). Both estimators were tested on a two-dimensional dataset.

The PCA based estimator calculates the directions of the greatest variance in three-dimensional space (one dimension more than the analyzed). Third dimension is formed by values of 0 and 1 which are the labels. From the dataset only subset of datapoints concerned by a rule is taken into considerations and standardized. For each new dimension a variance of the points subset is calculated. All values of variance are normalized to sum up to one. Then the direction of the highest subset variance is a vector close to the third added dimension (the labels). The two other directions indicate how separable the data really is (in the original space – without the labels). If they have different values of variance then it means that one given dimension has a greater ability to separate the data.

However, if the variances are similar then the information in those directions might not be helpful in classification. As E1 the value of 0.5 of difference between those two variances is taken. It might vary between 0 to 0.25, where greater value indicates that one direction can separate the data better than another.

Accuracy (E2) is defined as the number of correctly labeled samples, divided by the number of all samples (7). The value can range from 0 to 1, where 0 means that all samples were wrongly

classified and 1 means that all samples were correctly classified. To calculate an accuracy of one rule, only samples belonging to the set of linguistic values are considered.

$$E2 = \frac{number\_of\_correctly\_classified\_samples}{number\_of\_all\_samples} \qquad (7)$$

Results and discussion

Both estimators were verified on an artificial dataset, presented in Fig. 2. The dataset contains 1080 samples with two attributes and a binary label (distinguished by mean of colors in the following figures). Two dimensions enables a good visualization of rules in ANFIS system as each linguistic value divides dataspace into two semi planes. In fact, each ANFIS rule can be perceived as a hyper cuboid (here only trapezoidal membership functions, that holds partition of unity rule in their linguistic variable are under consideration). Each cuboid (a rectangle in 2D space) is described by linguistic values (exactly two in 2D space). Thus, presenting results in the figure each division of space, that has a form of rectangles, is considered as a single rule. Wider division lines indicate the size of fuzzy regions between kernels of fuzzy values.
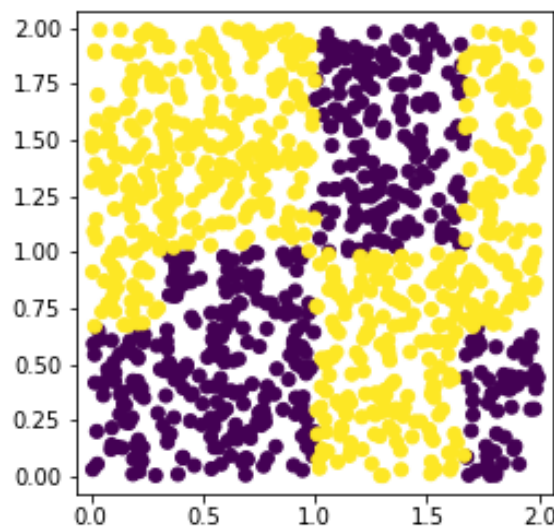

Fig. 2. The dataset on which estimators were tested
Source: own study

Learning ANFIS system with two values in each dimension

The Fig. 3 and Tab. 1 presents the results of learning ANFIS system with two values in each dimension. The results in tables 1-3 will be presented in an order analogous to the figures, where left upper corner of a figure corresponds to estimators in left upper corner of a table.
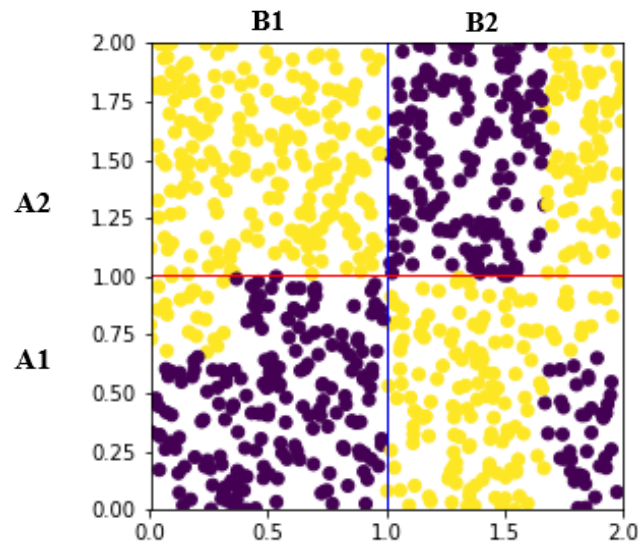
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Fig. 3. Results of learning ANFIS system with two values in each dimension
Source: own study

Tab. 1. Estimators' values for learned ANFIS system with two values in each dimension

	Linguistic value B1		Linguistic value B2	
	E1	**E2**	**E1**	**E2**
Linguistic value A2	0	1	0.13	0.67
	Rule 1		Rule 2	
Linguistic value A1	0.1	0.9	0.11	0.79
	Rule 3		Rule 4	

Source: own study

As shown in the Fig. 3 and confirmed by both estimators only one rule – Rule 1 - of highest performance. Its accuracy was equal to 1, what meant that all the samples were correctly labeled, and also the value of E2 was equal to 0. Both estimators indicate that Rule 2 does not perform well, because E1 is high and E2 is low.

Learning ANFIS system with two values in the first dimension and three values in the second
The next experiment of learning ANFIS was performed on the same dataset but with different number of linguistic value in one dimension. The results are presented in Fig. 4 and in Tab. 2. The final error of the system was smaller than in previous experiment, so the results were much better than in previous example.
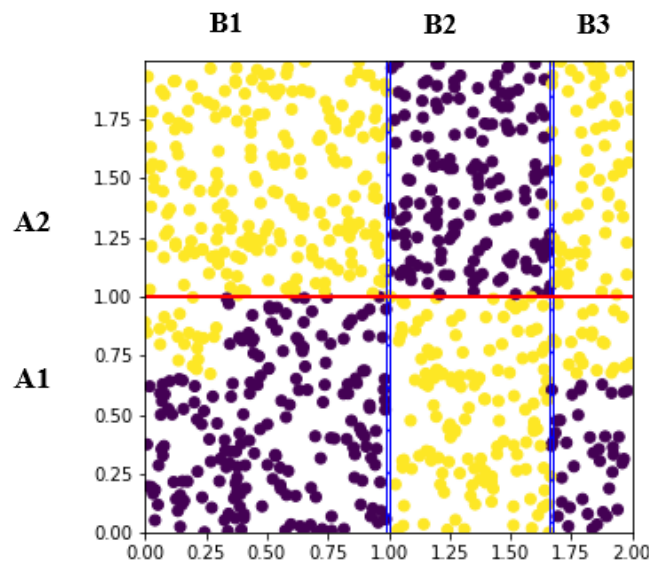
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Fig. 4. Results of learning ANFIS system with two values in the first dimension and three values in the second
Source: own study

Tab. 2. Estimators values for learned ANFIS system with two values in first dimension and three values in second

	Linguistic value B1		Linguistic value B2		Linguistic value B3	
	E1	**E2**	**E1**	**E2**	**E1**	**E2**
Linguistic value A2	0	1	0	1	0.01	0.99
	Rule 1		Rule 2		Rule 3	
Linguistic value A1	0.09	0.9	0.035	0.99	0.13	0.81
	Rule 4		Rule 5		Rule 6	

Source: own study

It can be observed that in the above case there are four rules (1, 2, 3, 5) which have correct results – value of E1 is 1 or 0.99. The most inefficient rule is rule 6, as the value of E2 is only 0.81. The rule 4 shows an interesting property of E1. Although the outcome of that rule is not perfect (E2 equals 0.9), the estimator E1 indicates that there is no leading direction for improvements (E1 yields 0.09). That means that estimator E1 cannot be used separately from other measures as it is not sensitive in each case.

Learning ANFIS system with three values in each dimension

The final evaluation of estimators involves learning of ANFIS system with three linguistic values for each dimension. The system achieved final error, which was smaller than in previous two cases.
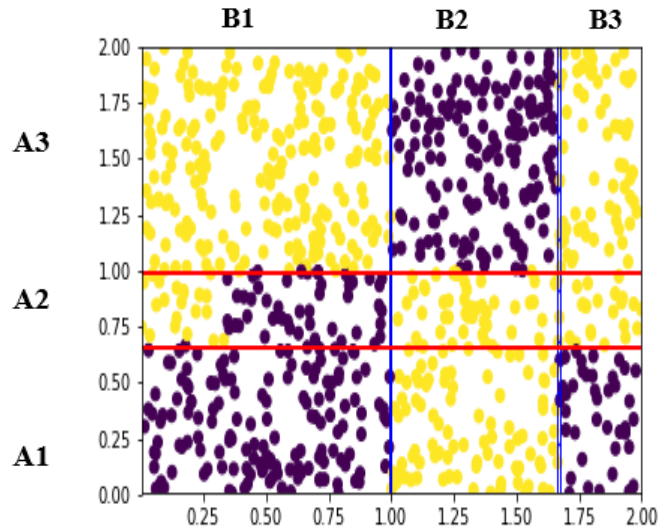
Fig. 5. Results of learning ANFIS system with three fuzzy values in each dimension
Source: own study

Tab. 3. Estimators' values for learned ANFIS system with three fuzzy values in each dimension

	Linguistic value B1		Linguistic value B2		Linguistic value B3	
	E1	**E2**	**E1**	**E2**	**E1**	**E2**
Linguistic value A3	0	1	0	1	0	1
	Rule 1		Rule 2		Rule 3	
Linguistic value A2	0.12	0.69	0	1	0	1
	Rule 4		Rule 5		Rule 6	
Linguistic value A1	0	1	0	1	0	1
	Rule 7		Rule 8		Rule 9	

Source: own study

The final experiment shows that increased number of linguistic values leads to a better outcome in terms of smaller error and better values of proposed estimators. Here only one rule (Rule 4) has a low value of E2 – 0.69, while other classifies all samples correctly, as its E2 equals to 1.

Summarizing all presented results, a conclusion can be stated that it is possible to detect which rule in the system contributes mostly to the error (6), as the measure of error is strongly correlated to E2. What is more, it is also possible to find which rule can be easily improved by choosing the one with greatest E1 value. The concept can be implemented as a space division algorithm to match the exactly needed number of linguistic values. This issue is important because each additional linguistic value significantly extends the space in which we search for the solution and, a as a result of increased computational burden, the system is learning slower.

Conclusions

The analysis of two presented estimators suggests that they have different properties and each of them indicates different phenomena. Estimator E1 gives a hint if one of the dimensions in the

dataset is dominant and splitting the rule in two might give better results. However, if misclassified samples do not distribute along any of the data dimensions then estimator E1 will not indicate that. Estimator E2 is helpful in rule's overall performance assessment, however it does not suggest whether an improvement is possible or not. It verifies only how accurate the rule is.

Presented estimators can serve as a help in search for rules that can be improved. The knowledge of where the error occurs can be used to reduce the computational complexity of the problem, e.g. by extracting problematic region and solving it as a subproblem. The future work is to implement that approach to improve the learning process of the system.

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IMPACT OF AUTHORITY 3.0 ON SYMBOLIC CONSUMPTION AMONG CILDREN AND YOUTH

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Abstract:

Authority 3.0 is a new type of authority, which was born is social media and his impact is more and more influential on our behaviour and make people desire to follow portals, blog news and buy more and more fashionable products. This article goal is to show the results of survey showing impact of Authority 3.0 on symbolic consumption in group of kids. Method, which I used in problem verification was an experiment.

Keywords:

consumption, symbolic consumption, Authority 3.0, Internet

Introduction

For me, science is a tool to understand modern reality. Quick changing world makes, that We stop to understand social, cultural and civilization facts. Focusing on things that are material, we forget about things that really matters. In world of new technologies and power of mass media, taking a subject regarding impact of Authority 3.0 on symbolic consumption of kids I wanted to show how important role can Authority 3.0 perform in life of a kid. A magical tool of media became persuasion, which ifluence especially on kids, they became the main target of manipulation. Their acts and tendency to consume, became a subcject of my research. In my thesis I wanted to check if new authority among internet users have an impact on kids consumption. The way to get to know this relations was experiment organization. For many years I am interested in behavioral addictions, in particular Internet addiction, which became a subject of My bachelor. I described in it direct effects and uncontrolled usage of Internet even among youngest kids, thereby disturbing child development. Knowing the scheme of Internet addiction, I wanted to understand, why often parents themselves, unconsciously hand for their kids tool strongly affecting and addicting, which is tablet or smartphone. Psychology, neurodidactics and the impact of new media always interested me. In my Master thesis I wanted to combine 3 factors to each other: Internet, human and value. This is how proposal of my theme was made: Impact of Authority 3.0 on symbolic consumption among children and youth.

Terms

Ambassadors of brands in Internet, Influensers, Celebrities, Blogers, Youtubers and all of people, which with their photos, films, tips convincing the audience, are called Authority 3.0. In XXI century perception of autorithy and its defining subject to many meaningful and functional transformations. It is mainly connected with different understanding and redefining norms and valuables [1]. Although, everyone of us needs authority, that would be some kind of signpost of life [2]. Increasingly, this kind of signpost became Influencers, Youtubers and Blogers. They are brands promotors, getting dressed fashionably and originally, eat healthy, have interesting life, travel a lot and offers tempting discounts in Internet shops. In modern Times, contatct with person like this is is easier, because of globalization development, where main role is taken by Internet, known as source of instant communicator – e-mail, social services, advertising, shops, Internet auctions etc [3]. Fans of their „stars", becomes co-organizers of their lifes. It happens when, celebrity creates a survey called „how to dress?" or „what to buy?" showing fans two propositions, who vote in the comments. Fan have an impression, that he have high driving power in life organization of his idol. Thinking about authority, I share Katarzyna Olbrycht definition according to which, authority is a master, personification of perfection, a model worth imitating. Authority becomes a person characterized by honest and justice. He is some kind of leader, who shows others how to live [4]. Authority in old times were authentic pattern of bravery and heroism. In modern times, to become authority it is not necessary to have outstanding skills. All You need is an interesting hobby or idea for presenting yourself [5]. The most important thing is possibly the biggest number of followers. Increasingly, asking the child who would he like to be in the future, You can hear an answer like Youtuber. To be clear, You do not need to do much, it is enough to be funny and You can earn a lot. Where is a value in it? Heroism? Who is authority? The one who knows, or is it the one who has?

Consumption is one of the elements building new style of life in XXI century. It is media hidden tool, which is made to cause consumption in unscheduled way. The goal is steady consumption and loss of control over how much we consume. As a result, contact with the subject becomes addiction and natural stimulation. The beginning of the media surveillance according to the iGeneration document - addicted to smartphones was the introduction of the first Apple model in 2007 and the launch of the Facebook platform in 2012. These two events have contributed to the spread of mobile phones on the Internet. The mission of the mentioned application was to be an open communicated world. Facebook creators confirm that they consciously created an addictive tool. Their strategy consisted in the users taking as much time and attention as possible. The weaknesses of the human psyche were used. These applications destroyed social morality and disrupted the functioning of the whole society.

We live in a world where reality produces likes. The more likes, the more picture become attractive. That's how bloggers work, often unknowingly fueling consumption among observers, they earn a lot of money. Specialists acting on people know exactly what strength to use to tempt their victims. In a world of declining values and constant self-search, they succeed very well. Lack of self-acceptance, specific goals of life, self-confidence and loss of value cause that people do not know what they are really looking for. This is the way adults and young adults want to make

the best use of the new ones proposed nowadays. This was influenced by cultural, economic and civilizational changes. Polish society is trying to imitate well-developed Western countries. Children want to imitate their parents. And the parents themselves want to provide their children with everything they have not experienced in the past.

The second important concept closely related to my research is the term symbolic consumption. For a specific product to have a symbolic function, it must contain two features: "visibility" and "meaning" [6]. Products are a symbol that indicates who you are and let you identify a person with an appropriate social group, and their public demonstration is called consumption for the show. Show consumption is associated with buying and demonstrating products in order to attract attention and gain prestige [7]. The choice of specific goods, despite high voluntary capacity, is limited by the influence of others, in the case of my research, with the authority of 3.0. On the other hand, the success of selling products is connected with the ability to include goods in a specific lifestyle characteristic for a given group, at the same time making it attractive and necessary [7].

Description of research

In an experimental study, which I carried out, forty students participated in the age range 9 to 11 years, including 19 girls and 21 boys. Girls accounted for 47.5% of the group, while boys accounted for 52.2%. Pupils from the 3rd to the 5th grade of elementary school were divided into two groups, the first one, the second one, and the experimental one. Preparation for the research was extremely labor-intensive and required a lot of commitment. The aim of the study was to find out whether the Authoritative 3.0 affects symbolic consumption of children. The study assumes that the presence in the persuasive message of Authority 3.0 intensifies the tendency to symbolic consumption. An indicator of the propensity of symbolic consumption was the size of the luxury logo drawn by children on the product design - a tourist backpack.

Prior to conducting the actual experiment, pilot studies were carried out, which took the form of a diagnostic survey. Their aim was to identify representatives of the 3.0 Authority, which are important and recognized by the participants of the experiment. In order for the research to be objective, I did not impose authority in advance - that is, the basic data for conducting the experiment. It was extremely important to verify the information collected by the children themselves. The aim of the pilot studies was also to choose a brand recognized by children as luxurious and whose logo would be identifiable by the respondents. Pilot studies were carried out in several stages.

In the first stage, I asked students from the same school who did not participate directly in the study to write on the pages of three brands they know and the person who is their authority on the web. The brands Adidas, Gucci and Calvin Klein have proved to be the most popular. Then, in order to verify their knowledge, I prepared a tool in which children had to sign these three logos. Finally, I chose the Gucci brand for research, which was not associated with common products and was considered the most luxurious. Thanks to written proposals of authorities by children and statistics of bloggers, Influencers and Youtubers on the Internet, I created a scatterbrain of 22 names and pseudonyms of potential authorities 3.0 (Fig. 1).
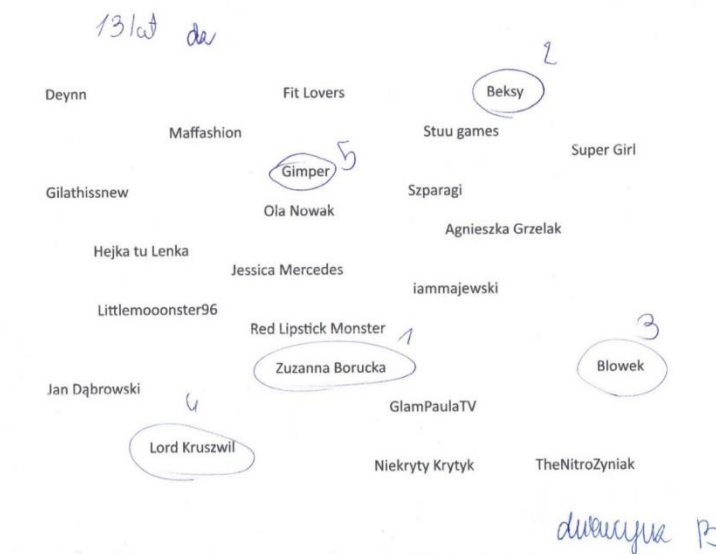
Fig. 1. Identification of authority
Source: Own coverage

The results of this phase of the study showed that Lord Kruszwil (34 points), Blowek (26 points) and the Fit Lovers duo (24 points) were the most respected (Fig. 2). In the ranking on graph No. 1, the names of those who did not receive any point were not included. Bearing in mind the great popularity of all the people who make up the first three places, I wanted to choose one that would be a real example and fit the profile of the story being developed for research. I wanted a person who could have a positive impact on children. Lord Kruszwil and Blowek are people who are popular only on YouTube, record everyday life and streams of computer games, while the Fit Lovers duo is a celebrity couple from YouTube, Instagram and blog, famous for their healthy eating, sporting lifestyle, they travel and are curious about the world, which is why I chose this duo as an example of Authority 3.0 in the proper study.
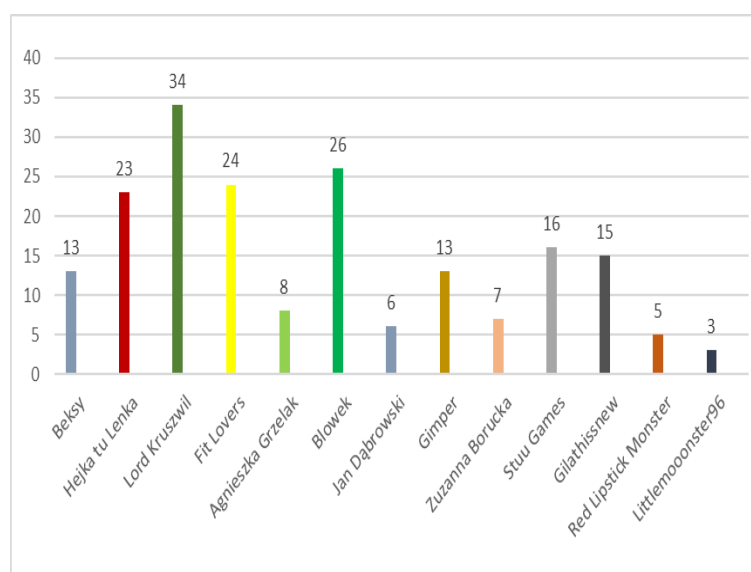

Fig. 2. Selection of Authority 3.0
Source: Own coverage

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As a product that was meant to be consumed, I chose a backpack. A travel backpack is not associated with a specific brand and is suitable for both sexes. Due to the fact that Fit Loversi were supposed to advertise it, it was enriched with the "eco" feature. That is why I painted his template with a bright green color associated with nature.

In the proper study, the children were asked to design a Gucci logo on a travel backpack. Students were divided into two groups: a control group and an experimental group. Both groups informed that the Gucci company, as part of one of its campaigns, "My and nature", invites you to cooperate in designing a new model of a travel backpack. It is primarily about the proposal to put the company logo on the backpack and indicate its size. The experimental group was also informed that the company had been invited by the Fit Lovers duo (Authority 3.0) to cooperate on the new backpack model. Control group did not receive an information about cooperation with the duo. After that, the children received a backpack with a backpack pattern and drew any size of the logo, anywhere on the backpack.

Analysis the results of research

At the beginning of the Chi - square test, it was checked whether the sex distribution was the same in the control and experimental group. The test result indicated that the sex distribution is similar in the control and experimental group (Tab. 1).

Tab. 1. Results of Chi – Square Tests: Distribution of sex in research groups

	Value	Df	Asymptotic Significance (2 – sided)	Exact Sig. (2 – sided)	Exact Sig. (1 – sided)
Pearson Chi – Square	,100ª	1	,752		
Fisher's Exact Test				1,000	,500
N of Valid Cases	40				

Source: Own calculations

In order to determine whether authority 3.0 and gender influence the size of the luxury logo, a two-way analysis of variance was carried out (See Tab. 2). As we can see in table 2, the influence of authority is statistically significant: F (1.36) = 6.58 p = 0.015. The obtained data shows that in the control group, the drawn logo was on average 43,45 cm2, while in the experimental group the average size of the logo was 88.21 cm2. In order to better illustrate the difference in drawing a logo in each group, Fig. 3 and 4 show logos with average sizes. The results of the statistical analysis showed that the gender did not have a significant impact on the size of the luxury logo: F (31.36) = 1.70 p = 0.20. A two-way analysis of variance also showed no significant effect of the interaction between the group and gender F (1.36) = 0.87 p = 0.36.

Tab. 2. The results of Tests od Between – Subjects Effects

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	27934,295 a	3	9311,432	3,031	,042	,202
	171618,612	1	171618,612	55,868	,000	,608
Authority 3.0	**20225,607**	**1**	**20225,607**	**6,584**	**,015**	**,155**
Sex	5206,421	1	5206,421	1,695	,201	,045
Authority 3.0 * Sex	2656,171	1	2656,171	,865	,359	,023
Error	110586,796	36	3071,855			
Total	311865,963	40				
Corrected Total	138521,090	39				

Source: Own calculations

Fig. 3. The average of logo draw from control group on 1:2 scale
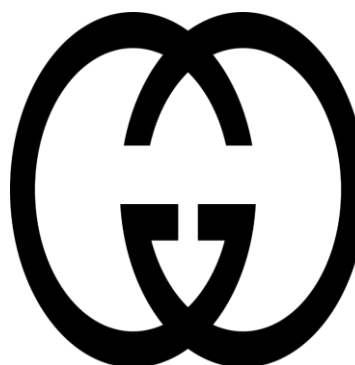Source: Own coverage

Fig. 4. The average of logo draw from treatment group on 1:2 scale
Source: Own coverage

Summary

Summing up the whole preparatory process for the study and the results of the research, I conclude that the hypotheses I have put forward have been proven. The results from the research clearly show that Authority 3.0 affects symbolic consumption among children. Which means that if children knew about the involvement of the Authority 3.0 they admired, that they drew a larger luxury logo than children from the control group, in which nothing was mentioned about Authority 3.0. Thanks to the results of my research, I can also say that the gender did not affect the size of the logo. In addition, after the research I noticed an interesting change in the behavior of children in this school. Students who took part in the study began to wear and buy Gucci clothing more often.

Telephones have become an indispensable tool for every human being. They are like panes between things that happening here and in the rest of the world. They are especially dangerous for children who do not understand the world of manipulation. As shown by the results of research, they are strongly exposed to the influence of people who in the media deal with propagating the ideal life and persuading them to buy expensive, luxurious items. In addition to what is beautiful and fashionable there is a small boundary between what is dangerous and socially unacceptable. The bad side of the Internet produces so-called "Patostream", imitation of which can be simply dangerous. Too much exposure to the influence of the media can cause the disappearance of values and creativity among children [5], and in the worst case it can also lead to addictions.

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ROLE OF TRYPTOPHAN CATABOLITES PATHWAY IN POSTPARTUM DEPRESSION

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Abstract:

It is estimated that 10% of women worldwide suffer from postpartum depression (PPD). A growing body of evidence suggests that disorders of tryptophan metabolism may play a significant role in the development of PPD. Thus, the aim of this paper is to elucidate the role of the tryptophan catabolites pathway in PPD development. Women with PPD were characterized by a low level of tryptophan, serotonin, and kynurenic acid. On the other hand, the development of PPD is also associated with an elevated level of neurotoxic compounds, including 3-hydroxykynurenine and quinolinic acid. In the future disorders in these biochemical pathways can be utilized as risk factors and diagnostic biomarkers of the postpartum depression. In addition, regulation of the biochemical processes may contribute to the development of a new, more effective and personalized therapy.

Keywords:

postpartum depression, tryptophan metabolism, genetics

Introduction

Depression is the most common mental disorder and affects 350 mln people in the world [1]. Depression will have become the second most frequent health cause of world economic decline and social disability by the year 2020, just behind ischemic heart disease [2]. One of the subtypes of depression is postpartum depression (PPD). Additionally, postpartum psychiatric disorders include postpartum blues, postpartum psychosis [3]. Postpartum blues appears for a few hours to few days after postpartum and includes confusion, mood lability, anxiety, and depressed mood. On the other hand, postpartum psychosis begins within four weeks postpartum, with delusions, hallucinations and gross impairment in functioning [3].

Postpartum depression is very serious perinatal mood disorders and unfortunately is often missed by primary care teams [4,5]. Despite the prevalence is 1-2 per 1000 childbirths, women are approximately 22 times more likely to experience the onset of a mental disorder in the first month postpartum than at any other time in their lives [6]. It is estimated that about 10% of women in the early weeks postpartum suffer from PPD [7]. Moreover, women with postpartum depression characterised by a 50% to 62% risk for future depressions [8]. PPD symptoms include depressive disorder, confusion, insomnia, anxiety, sadness, misery, apathy, irritability, social isolation, failure to cope and guilt, agitation and suicidal tendencies [9]. Interestingly, half of the women with

postpartum depression have first symptoms already during pregnancy [10]. The causes of postnatal depression are not fully known; however, previous studies suggest that impaired tryptophan metabolism may be involved in the mechanism of PPD pathogenesis [11, 12]. The aim of this paper is to explain the key role of tryptophan catabolites (TRYCATs) pathway in the development of postnatal depression based on the available literature.

Tryptophan and its metabolism

Tryptophan (2-amino-3-indole propionic acid) is an essential exogenous aromatic amino acid. Tryptophan is easily absorbed from the gastrointestinal tract and the daily requirement of an adult is about 5 mg/kg of body weight. The main sources of tryptophan are pumpkin seeds, sesame seeds, cocoa, cheese, pork and poultry [13]. About 30% of tryptophan is used for protein synthesis. The remainder of the tryptophan is degraded through the kynurenine pathway and non-protein transformations to the serotonin and melatonin. In the organisms, the amino acid undergoes three types of metabolism changes: (i) the formation of kynurenine in the reaction of indole ring opening, (ii) the generation of serotonin, (iii) decarboxylation and the formation tryptamine. In the central nervous system, tryptophan is a substrate for the production of melatonin and serotonin [14]. In the tryptophan catabolites pathway (Fig 1.), 2-amino-3-indole propionic acid is first catalyzed in kynurenine (KYNU) through the rate-limiting enzyme TDO or IDO (tryptophan 2,3-dioxygenase and indoleamine 2,3-dioxygenase). Then, KYNU is degraded in two different ways. In one way, KYNU may be catalyzed into 3-hydroxykynurenine (3-HK) by kynurenine 3-monooxygenase (KMO), and then 3-HK is further converted to quinolinic acid (QUIN). The second way, KYNU is catalyzed into kynurenic acid kynurenine aminotransferase (KYNA) by KAT after transamination. The KMO mainly acts in the microglia while KAT is mainly expressed in astrocytes. Moreover, 3-HK may be converted to serotonin by tryptophan hydroxylase 1/2 (TPH1/TPH2), and them serotonin is further transferred to melatonin by hydroxyindole-O-methyltransferase (HIOMT) [15].
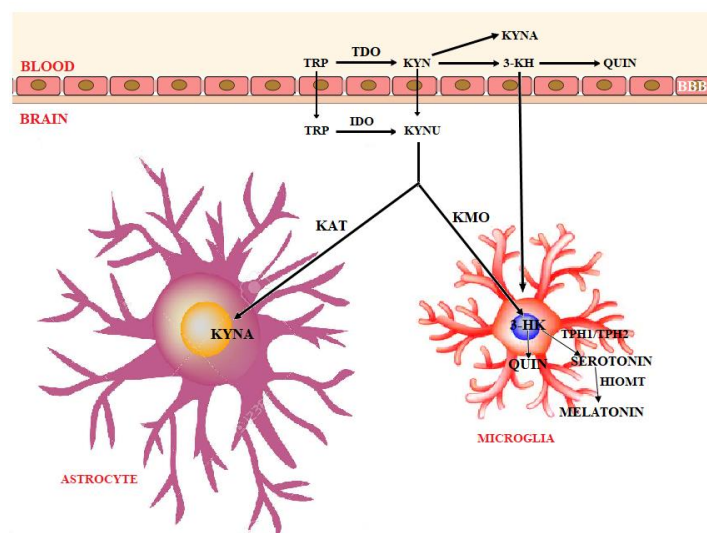
Fig. 1. Tryptophan catabolites pathway in blood and brain. KYNU: kynurenine; TDO: tryptophan 2,3dioxygenase; IDO: indoleamine 2,3-dioxygenase; KMO: kynurenine-3monooxygenase; QUIN: quinoline acid; KYNA: kynurenic acid; KAT: kynurenine aminotransferase; TPH1/TPH2: tryptophan hydroxylase1/2; HIOMT: hydroxyindole-O-methyl transferase; BBB: blood-brain-barrier
Source: Figure prepared by yourself

Tryptophan catabolites pathway in the development of postnatal depression

Although the pathogenesis of the PPD is not fully understood, there are reports about the role pathway of tryptophan catabolites in the development of the disease. Previous studies showed that the plasma concentration of tryptophan was significantly decreased in late pregnancy and then is normalized by the end of the puerperium [16, 17] Similarly, other studies confirmed the hypothesis that the plasma level of tryptophan in pregnant women decreased and after postpartum is gradually increased [18, 19]. Additionally, Handley et al. (1977) found that the plasma level of tryptophan increased after postpartum, and in addition, the change was positively correlated with a mood of matter during the postpartum period [20].

The next compound associating with tryptophan metabolism is serotonin. Serotonin is an important neurotransmitter and plays a key role in the regulation of emotion [21]. In 1965 the serotonin hypothesis of depression was presented by Schildkraut. The theory indicated that deficiency of serotonin in the brain is a risk factor of depression development [22]. Bailara et al. (2009) suggest that insufficient serotonin in brain tissue may be one of the factors contributing to PPD development [23]. A recent study showed that in mid-late pregnancy and the early postpartum period the perinatal plasma serotonin level was significantly reduced as compared to a control group [24]. Moreover, other studies showed that the platelet serotonin levels and the serotonin transporter binding sites were decreased in women with PPD [25]. Interestingly, genetic studies indicated that STin2 VNTR polymorphism of 5-HTTPR and polymorphism of TPH2 (tryptophan hydroxylase 2) gene (2755A allele) were associated with PPD occurrence [26, 27]. Similarly, the polymorphisms of TPH1 and TPH2 gene increased the risk of major depression occurrence [28].

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The other findings showed that PPD patients were also characterized by increased IDO activity [19, 29]. IDO is a rate-limiting enzyme of the first step of the tryptophan catabolites pathway. Moreover, IDO activity may be stimulated by proinflammatory cytokines (e. g. IL-6 and TNF-α). Due to the reduced IDO activity, in the course of the pregnancy, the lower level of kynurenine was observed and it has still normalized in the late postpartum period [19, 29]. However, the recent study indicated that women with PPD were characterized by a decreased level of kynurenine as compared to healthy women after postpartum [30]. In the case of major depression, patients were characterized by increased activity of IDO [31, 32].

The next finding showed that depressed patients were characterized by increased plasma levels of harmful tryptophan metabolites, including 3-hydroxykynurenine and quinolinic acid. On the other hand, patients with depression had decreased levels of neuroprotective compounds, kynurenine acids [33]. In the case of PPD, Veen et al. (2016) found that in healthy postpartum women was observed a low level of 'neuroprotective' kynurenic acid and higher levels of 'neurotoxic' 3-hydroxykynurenine as compared to healthy non-postpartum women. Thus, the results suggest that the PPD may be associated with strong inhibition of the kynurenic acid during the physiological postpartum period [30]. The generation of 3-HK is associated with KMO activity. The previous study showed that the PPD pathophysiology may be associated with elevated expression and activity of KMO. This status may be results of proinflammatory cytokines overproduction in course of PPD (e.g. IL-1β, IL-6, TNF-α, and IFN-γ) which may induce a KMO expression [34, 35].

The last metabolite of tryptophan is melatonin. Parry et al. (2008) found that the plasma nocturnal melatonin concentrations were lower in depressed pregnant, but higher in depressed postpartum women than healthy women [36]. In turn, patients with major depression exhibit a different sleep disturbance that can be caused by a low level of melatonin [37]. Moreover, severe insomnia is positively correlated with suicidal attempts in patients with depression [38].
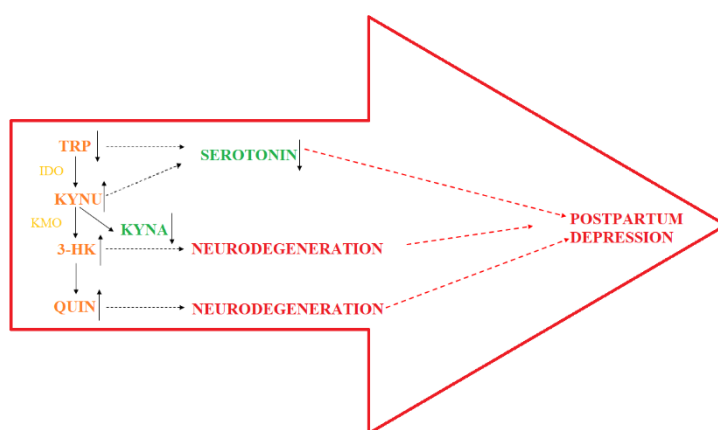

Fig. 2. The mechanism of the disorder in the kynurenine pathway participated in postpartum depression
Source: Figure prepared by yourself

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Treatment of postpartum depression

PPD treatment includes a different of psychotherapy, pharmacotherapy, preventative exercise, acupuncture, massage, morning light exposure and hypnosis [39, 40]. As described above, PPD is associated with insufficient of serotonin in the brain. Therefore, the most commonly used treatment is antidepressants, including selective serotonin reuptake inhibitors (SSRIs) [41]. SSRIs bind at the serotonin reuptake transporter in the synaptic cleft and prevent its re-uptake, subsequent degradation and cause its accumulation in the synaptic cleft [42]. The mechanism of SSRIs action is presented in Fig. 3.
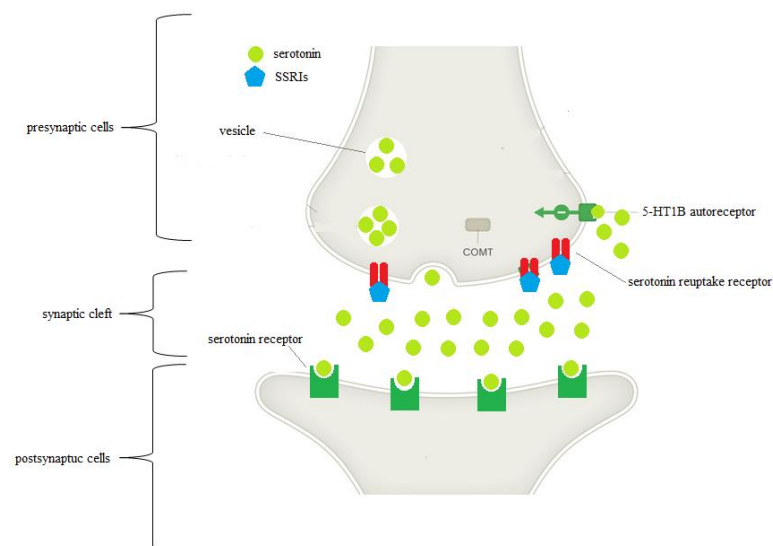
Fig. 3. The mechanism of SSRIs action in synaptic cleft
Source: Figure prepared by yourself

Previous studies showed that depressed patients with deficiency of tryptophan were characterized by the positive response to SSRI treatment [43]. In turn in the case of PPD that SSRI therapy, including fluoxetine or paroxetine, is more effective than placebo in women with PPD [44, 45]. Moreover, a low level of estrogen, observed in the course of PPD, contributed the inhibiting SSRI efficacy [46]. Thus, PPD treatment should include changes in hormone levels, especially estrogen, in women after childbirth. Moreover, the SSRI increases the availability of serotonin thus contributing to the relief of PPD symptoms [47].

Postpartum depression and child development

Maternal depression has implicated on the development of a child into toddlerhood, preschool age, and even school age. Postpartum depression may cause a higher preterm birth, low birth weight, pre-eclampsia, and spontaneous abortion. Moreover, an older child may have an affective disorder, anxiety disorders, conduct disorders and lower cognitive performance [48]. Children whose mothers

had suffered from postpartum depression were characterized by more behavior problems and lower cognitive functioning than children whose mothers were healthy [49]. Infants of depressed matters were more drowsy and fussy as compared to infants who had matter without depression [50]. Children whose matters had depression have shown a higher risk for non-verbal communication delays (e.g., interpreting gestures) [51]. The previous study showed that the child was characterized by underweight if their mothers showed symptoms of depression [52]. Additionally, maternal depression may increase the risk of stunted child [53]. Interestingly, symptoms of postpartum depression occur in the course of pregnancy and may be associated with increased risk for premature delivery [54]. Other studies indicated that postpartum depression may lead to externalizing difficulties in a child, including attention deficit hyperactivity disorder, oppositional defiant disorder, and conduct disorder [55, 56]. Moreover, nest study showed that postpartum depression may be associated with low levels of general cognitive development, including IQ scores in childhood [57].

Concluding, disorders of child development may be a consequence of abnormal mother-child rebirth in the postpartum depression period. In addition, as noted above, the lack of proper mother-child relationship may lead to the development of psychiatric disorders in school and adult children.

Conclusion

According to the existing literature, postpartum depression is widely spread mood disorders but the knowledge of PPD development mechanism is still insufficient. Moreover, it should also be noted that the molecular mechanisms of PPD and major depression develop in many ways different. The previous data indicate that the participation of certain biochemical processes, including disorders of tryptophan metabolism, in the PPD pathogenesis and resistance to traditional pharmacology. The next studies may contribute to the development of effective biomarkers in the future. Moreover, regulation of the specific molecular process, including tryptophan catabolites pathway, may provide novel therapeutic targets and more effectiveness, personalized antidepressant therapy. Therefore, it is necessary to continue research in order to confirm the links between the postpartum and the biochemical pathways.

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ROLE OF SELECTED CYTOKINES IN HEART DISEASES

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Abstract:

Cardiovascular diseases are the main cause of deaths in Poland. Out of over 180 000 deaths in 2015, about 60-70% were caused by heart diseases. Despite having huge knowledge about pathophysiology, the role of cytokines – small proteins, which are responsible for communication between cells, in cardiac diseases is still investigated. It is currently known that some of them play positive role and others contribute to development of cardiac injury. Although there were couple of trials, no satisfactory anti-cytokine therapy is currently available. However, there are numerous works associated with heart disorders and cytokines, most of them focus only on one cytokine or disorder. This review will focus on presenting in a comprehensive way, currently available knowledge about the role of selected cytokines (TNF-α, TGF-β, IL-1, IL-6, IL-10 and IL-18) in different cardiac diseases (acute myocardial infraction (AMI), heart failure (HF) and cardiomyopathies).

Keywords:

cytokines, heart diseases, acute myocardial infraction, heart failure, cardiomyopathy

Introduction

Cardiovascular diseases, with over 180 000 deaths in 2015 (45,6% of all deaths), are the main cause of deaths in Poland. With standardized death rate, which is over 610 per 100 000 inhabitants, they are one of the biggest challenges for the health system in Poland. What is worth mentioning is the fact that cardiovascular diseases affect more often men than women (standardized death rate for men: 753,8 vs 508,2 / 100 000 for women) and older people (standardized death rate for people <65 years old – 86,4 vs 2774,2 / 100 000 for people 65 and older). Cardiovascular can be divided in 6 main categories: ischemic heart disease (with standardized death rate 180,1/100 000 for men and 93,6/100 000 for women), acute myocardial infraction (standardized death rate 64,4/100 000 for men and 28,1/100 000 for women), other ischemic heart diseases (standardized death rate 115,8/100 000 for men and 65,6/100 000 for women), other heart diseases (standardized death rate 288,3/100 000 for men and 188,0/100 000 for women), cerebrovascular diseases (standardized death rate 115,6/100 000 for men and 89,2/100 000 for women) and other diseases of circulatory system (standardized death rate 169,8/100 000 for men and 137,4/100 000 for women) (Tab. 1.) [1].

Tab. 1. Standardized death rates of different cardiovascular diseases in 2015 in Poland

Cardiovascular diseases	Standardized death rates (per 100 000 male/female inhabitants)	
	Males	Females
ischemic heart disease	180,1	93,6
acute myocardial infraction	64,4	28,1
other ischemic heart diseases	115,8	65,8
other heart diseases	288,3	188,0
cerebrovascular diseases	115,6	89,2
other diseases of circulatory system	169,8	137,4

Source: own edition of date, basing on Cardiovascular diseases Statistics, Statistics Explained, Eurostat
https://ec.europa.eu/eurostat/statistics-explained/pdfscache/37359.pdf

Cytokines are a group of small proteins, which are responsible for transmitting signals between cells [2, 3]. They can be produced by different types of cells – macrophages, endothelial cells, B lymphocytes, T lymphocytes, fibroblast, mast cells and various stromal cells. Moreover, one cytokine can be produced by different cells and one cell can produce different types of cytokines [4]. Cytokines can be divided into: interleukins (IL), chemokines, lymphokines, interferon, the tumor necrosis factor (TNF) family and the transforming growth factor beta (TGF-β) family [5, 6]. All cytokines perform their functions by binding with their specific receptors [7]. It is worth mentioning that these receptors can be both membrane-bound or soluble [8].

The aim of this study was to summarize available knowledge about the role of selected cytokines (TNF-α, TGF-β, IL-1, IL-6, IL-10 and IL-18) in different cardiac diseases (AMI, HF and cardiomyopathies).

Role of TNF-α in heart diseases

TNF-α is a cell signaling a protein which is produced mainly by macrophages, but other cells like white blood cells, dendritic cells, epithelial cells, endothelial cells, fibroblasts, neurons, osteoblast and cardiac myocytes can also produce TNF-α [4, 9]. TNF-α occurs in two forms: cytosolic and membrane-bound. Its main function is to regulate the immune system. TNF-α has two corresponding receptors: TNFR1 and TNFR2 [10]. What is interesting is the fact that both receptors seem to have divergent signaling [11]. TNF-α was shown to be toxic, through the activation of TNFR1 and protective by activation of TNFR2 receptor, in a murine model of myocardial infraction (MI) [12]. It is also known that the level of soluble TNFR1 can carry a prognostic information and be an independent predictor of heart failure (HF) and mortality in patients with acute myocardial infraction (AMI) [13]. There are also reports which showed that low concentrations of TNF-α were found to have cardioprotective effects, whereas high concentrations were shown to have harmful effect on heart after myocardial ischemia [14].

TNF-α were also found to be higher in patients suffering from HF [15]. These levels seem to be especially elevated in patients with most advanced stadiums of a disease, low serum sodium concentration, poor renal function, high plasma renin activity, cachexia, and anemia [16]. It is also known that TNF-α genes expression positively correlated with the level, the severity and the etiology of HF [17]. The TNFR1/2 (mRNA and protein level) was shown to be associated with

HF risk in patients with diabetes mellitus type 2 [18]. There is also a study which shows that transgenic mice with cardiac restricted overexpression of TNF-α developed HF. It was characterized by cardiac dilatation, ventricular hypertrophy, diminished left ventricular (LV) function, extracellular matrix remodeling, fibrosis, loss of alpha adrenergic response, activation of fetal genes and premature death [19]. It was suggested that each form of TNF-α (membrane-bound and soluble) have different biological action. The overexpression of membrane-bound form resulted in ventricular hypertrophy and consequent dysfunction and the overexpression of soluble form resulted in ventricular dilation and consequent dysfunction [20]. It is worth mentioning that clinical studies show that the treatment with angiotensin receptor antagonists can lead to significant reduction of TNF-α level, in patients with HT [21]. There is also evidence that the treatment of HF with ACE inhibitors, β-blockers, diuretics and digoxin results also in reduction of both TNF-α and IL-6 [22]. There is also a report which showed that physical training in patients with HT reduces level of TNF-α, TNFR1, TNFR2, IL-6 and IL-6R [23]. Although there is an extensive body of evidence supporting the fact that TNF-α takes part in pathophysiology of HF, large, clinical trials did not show any benefit of TNF-α antagonism in people with HT [24].

Role of TGF-β in heart diseases

TGF-β family is a group of 30 cytokines, out of which four - TGF-β1-4 are the main ones. These cytokines control a lot of cell processes – including cell proliferation, differentiation and apoptosis. They function after binding with membrane receptors (TGFR), which can be divided in 2 subgroups – type I and II) [4].

TGF-β is known to be involved in cardiac remodeling [25]. TGF-β1 signaling was recognized as one of the most significant mediators of cardiac fibrosis and hypertrophy [26]. After AMI, TGF-β was observed to take part in the formation of border zone. It was also shown that TGF-β suppressed inflammatory response and limited its expansion into the non-infracted area. There is also a report in which the genetic disruption of trombospondin-1 (activator of TGF-β) was shown to produce expansive postinfarction inflammation resulting in massive fibrosis and LV remodeling [27]. TGF-β1 was also identified as stimulus in the chronic inappropriate wound healing phase of myocardium, which led to stiffening and hypertrophic scarring of heart, and resulted in heart failure due to MI [4]. It was also shown that there is an increase in TGF-β1 gene expression during the transition of stable hypertrophy to HF, which can support a view of involvement of TGF-β1 in development of LV dilatation [28]. TGF-β was also recognized as a factor, which is involved in cardiac fibrosis in diabetic cardiomyopathy [29]. In another study, it was found that TGF-β level in patients with hypertrophic cardiomyopathy was associated with large left-atrial size, high BNP levels, thick intraventricular septum and increased number of clinical adverse events [30]. In contrast to these findings, another study showed a decreased level of TGF-β1 in patients with hypertrophic cardiomyopathy which negatively correlated with diastolic dysfunction [31]. Further studies need to be done to fully investigate the role of TGF-β in cardiomyopathies.

Role of IL-1 in heart diseases

IL-1 is a pro-inflammatory cytokine which is responsible for regulation of inflammatory response associated with acute and chronic diseases [4]. IL-1 has a natural receptor antagonist (IL-1Ra) which acts like an anti-inflammatory cytokine by binding to IL-1 receptor [32].

IL-1 has been shown to increase during AMI and because of that, it is considered to play an important role in the development of heart injury during AMI [33]. Moreover, it has been shown that the use of certain cardioprotective interventions against I/R (for example pterostilbene [34], embelin [35], diosgenin [36]) is associated with the reduction of IL-1 level in heart. What is more, administration of IL-1Ra was shown to protect myocardium and reduce infract size in experimental infusion-reperfusion injury (I/R) in mice [37]. Other study showed that inhibition of IL-1 was associated with the reduction of myocardial injury, preserved LV function and reduced inflammasome activation in mouse model of MI [38]. There is also some evidence which supports the idea of IL-1 taking part in the development of dilated cardiomyopathies (DCM) [39]. An increased level of IL-1 is also observed in acute myocarditis, which may progress to DCM [40]. When it comes to HF, most of the studies have not shown an increased level of IL-1 in HF [41, 42] and, in addition, the level of IL-Ra seems to be increased during HF [43]. It can be surprising, because the level of another inflammatory cytokine – TNF-α, seems to be increased during HF. However, there is also some evidence of increased level of IL-1 in HF [43]. Further studies, which will finally define the role of IL-1 in HF, are needed.

Role of IL-6 in heart diseases

IL-6 is a pro-inflammatory cytokine which is secreted by various cell types. IL-6 has a pleotropic effects which are conducted by receptor system which consists of two molecules : IL-6R (IL-6 receptor) and gp130. IL-6 receptor is present in two forms – membrane-bound and soluble [4].

IL-6 is one of the best examined cytokine in the context of heart diseases. There are some reports about the elevated level of IL-6 in patients post-MI [44, 45]. The level of IL-6 was also shown to correlate positively with thyroid status in AMI patients [46]. Moreover, the patients in cardiogenic shock after AMI have significantly higher levels of IL-6 (as compared to patients without cardiogenic shock) [47]. It is also known that patients after AMI have elevated level of IL-6R [48]. There is also a report about reduced infract size after I/R, in IL-6 deficient mice, [49] which supports the hypothesis of crucial negative role of IL-6 in AMI. Although the blockade of IL-6R by monoclonal antibodies did not prevent cardiac remodeling in mice after I/R, there is some evidence to prove that a single dose of IL-6 antagonist has a positive effect (attenuated inflammatory response, lower troponin release, increased VCAM-1 levels) on patients with non ST-elevation MI (NSTEMI), though it does not affect coronary flow [50, 51].

Elevated levels of IL-6 have also been observed in patients with DCM or hypertrophic cardiomyopathy [52]. There is also a report which showed that patients with idiopathic dilated cardiomyopathy (IDCM) and increased IL-6 levels have a higher incidence of congestive HF [53]. There is also evidence that the levels of IL-6 in heart tissue in patients with IDCM are higher,

compared to patients with ischemic cardiomyopathy (ICM) [54]. It has also been shown that polymorphism of IL-6 gene is associated with higher risk of IDCM [55]. These data suggest that IL-6 plays a significant role in the development of cardiomyopathies, especially IDCM, and that in the future, the IL-6 antagonist therapy can be one of possible treatments for such patients.

The role of IL-6 is also well established in HF. It is known that levels of IL-6 are elevated in patients with HF [43]. What is more, levels of IL-6 correlate with disease severity and can be one of prognostic markers in HF [56]. There is also a report which showed that the baseline levels of IL-6 are a predictive factor of development HF in 5 years [57]. It was also shown that efficient therapy of heart failure, reduces the level of IL-6 [22]. All these reports support the view that IL-6 plays a significant role in HF.

Role of IL-10 in heart diseases

IL-10 is one of the main anti-inflammatory cytokine. It is produced by many different cells. IL-10 regulates the immune system by inhibiting secretion of pro-inflammatory cytokines. It also acts as an antioxidant [4].

It has been documented that, after AMI in rats, the level of IL-10 protein and its mRNA is decreased. What is more, the decrease of the level of IL-10 correlated with depression of cardiac function which progressed to HF [58]. Moreover, there are also reports which suggest that the use of cardioprotective interventions increases the level of IL-10 and improves cardiac function and/or decreases infract size [4]. What is worth noticing is the fact that the ratio between IL-10 and TNF-α, is very important because IL-10 antagonizes TNF-α actions. There is a suggestion that improper balance between these cytokines can be one of the factors leading to HF [58]. There is also a report which showed that treating mice with recombinant IL-10 results in a significant reduction of inflammatory process, improvement of LV function and inhibition of fibrosis [59]. There is also a report which pointed out that the infusion of IL-10 fifteen minutes prior to reperfusion (in murine ischemic model) results in the reduction of myocardial injury [60]. Finally, the trails with the use of bone marrow mononuclear cells (BM-MNC), which secrete significant amount of IL-10, showed that infusion of BM-MNC after AMI resulted in an increased stroke volume and decreased levels of LV end-diastolic pressure and end-systolic volume [61].

The reports concerning the role of IL-10 in cardiomyopathies are inconsistent. Some studies showed that in the DCM the level of IL-10 is significantly decreased [62], whereas others showed that lymphocytes B secretes increased the level of IL-10 in DCM [63]. There is also a report which showed that the level of IL-10 positively correlates with diastolic dysfunction in DCM [31]. The increased levels of IL-10 were also associated with higher amount of adverse events in patients with Takotsubo cardiomyopathy [64].

As for the HF and IL-10, there are not too many reports. It is currently known that the levels of IL-10 seem to be higher in patients with HF [65]. There are also some reports suggesting that in severe HF, the ratio of IL-10/TNF-α is significantly raised [57]. It was also shown that the efficient therapy of HF with β-blockers decreased the level of IL-10 in patients with HF [65].

Further studies aiming to definitely investigate the role of IL-10 and the ratio of IL-10/TNF-α in different heart diseases, especially HF and cardiomyopathies, are needed.

Role of IL-18 in heart diseases

IL-18 is a pro-inflammatory cytokine, which is involved in many immune and inflammatory disorders. Current studies have shown that adult cardiomyocytes express receptor of IL-18 (IL-18R), and their expression seems to be regulated by oxidative stress and other pro-inflammatory cytokines. IL-18 binding protein (IL-18BP) is a constitutive inhibitor of IL-18 activity [4].

It has been reported that the level of IL-18 is increased in patients with AMI [66]. Also, the level of IL-18 mRNA seems to be elevated in AMI [67]. There are also some reports about a positive role of IL-18BP administration. The administration of IL-18BP resulted in protection of myocardium against I/R, improvement of contractile function and decreased cardiomyocytes necrosis [4]. There were also tests in which IL-18 neutralizing antibodies administration prior to MI resulted in reduced infract size in mouse model of MI [68].

The role of IL-18 in HF and cardiomyopathies is not so well documented as the role of IL-18 in AMI. It is currently known that the level of IL-18 is elevated in HF and that the level of IL-18BP and its mRNA is downregulated [69]. There is also some evidence of a decreased expression of IL-18 RNA in DCM [70]. There is no doubt that there is a need for further studies which will investigate the role of IL-18 in HF and in different cardiomyopathies.

Conclusions

As it can be seen, cytokines have been reported to be associated with many cardiac diseases. Different cytokines have a different role in each of heart diseases – some of them can have a positive effects, whereas others play a negative role. Not only the level of each cytokine, but also the proper ratio between pro-inflammatory and anti-inflammatory cytokines seem to play a crucial role in pathophysiology of heart disorders. This review concentrated on the role of selected cytokines (TNF-α, TGF-β, IL-1, IL-6, IL-10 and IL-18) in some cardiac diseases – AMI, HF and different cardiomyopathies. The summary of the effects of selected cytokines in different diseases is presented in Tab. 2, 3, 4.

Tab. 2. Role of selected cytokines in AMI

cytokines	role in AMI
TNF-α	TNF-α – toxic through TNRF1, but protective through TNRF2
	Low concentration of TNF-α - protective, high concentration - harmful effect
	Soluble TNFR1 – prognostic information in patients with AMI
TGF-β	Responsible for formation of border zone, which suppress expansion of inflammation response
IL-1	Increased level in AMI
	IL-1Ra administration – protects myocardium, reduces infract size
	IL-1 inhibition – lesser myocardium injury, better LV function, reduced inflammasome activation
IL-6	Levels of IL-6 – increased after AMI, patients with cardiac shock after AMI have higher levels
	Levels of IL-6R – elevated in patients with AMI
	IL-6 deficient mice – lesser infract size
	single dose of IL-6 antagonist- positive effect after AMI in NSTEMI
IL-10	Level of IL-10 and its mRNA after AMI is decreased, the decrease correlates with cardiac function
	Cardioprotective actions increase level of IL-10
	The use of recombinant IL-10 in mouse model - improvement of LV function and inhibition of fibrosis
	Infusion of BM-MNC after AMI - increased stroke volume and decreased levels of LV end-diastolic pressure and end-systolic volume.
IL-18	Increased level of IL-18 after AMI
	Positive role of IL-18BP administration in patients with AMI
	Positive role of IL-18 neutralizing antibodies in mouse model of MI

Source: own edition of date, basing on different publications (see literature)

Tab. 3. Role of selected cytokines in HF

cytokines	Role in HF
TNF-α	Level of TNF-α - higher in patients with HF
	Positive correlation between HF and TNF-α gene expression
	TNFR1/2 (mRNA and protein level) associated with higher risk of HF in patients with diabetes mellitus type 2
	Cardiac-restricted overexpression of membrane-bound TNF-α – ventricular hypertrophy; overexpression of soluble TNF-α – ventricular dilation.
	TNF-α antagonist therapy is not beneficial for patients with HT
TGF-β	TGF-β- involved in chronic, inappropriate wound healing after AMI – leading to hypertrophic scarring and stiffening, which can lead to HF
IL-1	IL-1 level is not increased in HF
	IL-1Ra level is increased in HF
IL-6	Level of IL-6 – increased in patients with HT
	IL-6 level – correlates with disease severity and can be one of prognostic markers
	IL-6 baseline level – prognostic marker of risk of development of HT in patients without symptoms
	Efficient therapy - reduces IL-6 level
IL-10	Level of IL-10 – increased in patients with HT
	In severe HF, the ratio of IL-10/TNF-α is significantly raised
	Therapy with β-blockers - decreases level of IL-10 in patients with HF
IL-18	Level of IL-18 – increased in patients with HT
	Level of IL-18BP – decreased in patients with HT

Source: own edition of date, basing on different publications (see literature)

Tab. 4. Role of selected cytokines in different cardiomyopathies

cytokines	Role in different cardiomyopathies
TNF-α	Cardiac-restricted overexpression of membrane-bound TNF-α – ventricular hypertrophy; overexpression of soluble TNF-α – ventricular dilation.
TGF-β	TGF-β – involved in cardiac fibrosis in diabetic cardiomyopathy
IL-1	IL-1 – involved in development of DCM
IL-6	IL-1 increased in myocarditis, which can lead to DCM
	Level of IL-6 elevated in dilated and hypertrophic cardiomyopathies
	Increased level of IL-6 in patients with IDCM – higher risk of HF
	IL-6 gene polymorphism associated with IDCM.
IL-10	Increased level of IL-10 - associated with higher amount of adverse events in patients with Takotsubo cardiomyopathy
	Level of IL-10 positively correlates with diastolic dysfunction in DCM
IL-18	Decreased expression of IL-18 RNA in DCM.

Source: own edition of date, basing on different publications (see literature)

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