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TABLE OF CONTENTS

Bartczyk Natalia, Robak Monika <i>Improving the process of order picking from the e-shop.....</i>	5
Dziadek Jan <i>The third opportunity of postmodernism, theoretical design of a single-family house.....</i>	18
Dziobek Ilona <i>Resistance to oxidation of diesel oils and methyl esters of rapeseed oil fat content.....</i>	28
Konopelko Justyna, Kulikowska Urszula <i>Discrimination in the peer group as a crucial social issue in the modern world.....</i>	35
Krzemińska-Cieśla Maria <i>Styles of responding in a difficult situation of professional soldiers.....</i>	42
Lik Monika <i>Breeding of the ground bumblebee - <i>bombus terrestris</i> (l., 1758) in Poland.....</i>	54
Łożuk Klaudia, Zań Przemysław <i>Cognitive health during ageing, prevention of dementia and alzheimer's disease.....</i>	62
Pawlik Weronika, Drzonek Patrycja, Nowak Katarzyna <i>Severe hyperphosphatemia as the adverse effect of sodium-phosphate enemas use: Case Report and Review of the Literature.....</i>	68
Pawlina Dominika <i>Birth control, family planning and abortion in developing countries on the case study of samoa.....</i>	75
Pazder Przemysław M. <i>Political changes in Poland after 1989.....</i>	81
Smaruj Paulina, Bocian Katarzyna <i>Flow cytometric analysis of microorganisms.....</i>	87
Urban Edyta, Łukacz Martyna <i>Predictors of stress-related disorders in the professional activity of nurses and teachers.....</i>	95

IMPROVING THE PROCESS OF ORDER PICKING FROM THE E-SHOP

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Abstract:

This article concerns the e-shop order picking process on the example of company X. The purpose of the article was to determine the improvement of the picking process in a particular company. One of the online orders was analysed and the steps of the person completing the orders were evaluated in details. Then the solutions found in the order picking path were suggested. The fact that the employee has a wide knowledge of the assortment and where to store contribute to the creation of a professionally planned path that he is able to follow. Employee's knowledge of the assortment can undoubtedly be associated with completing the order in a shorter time what affects the implementation of more orders, retaining the same number of employees, which is an obvious costs saving for the company. An important problem to be solved in many enterprises is, therefore, streamlining the order picking process allowing to shorten the time needed to deliver the order to the final customer.

Keywords:

logistics processes, completion, warehouse, e-store, optimization

Introduction

Logistics in the field of warehouse management is aimed at coordinating the flow of materials and information to improve the activities related to the receipt, storage, completion and issue (sale) of products [1]. In the area of warehouse management, tools related to "lean management" can be widely used to conduct effective logistics operations. Due to the complexity of the processes and the relationships that occur between them, they can be improved, configured or modified on many levels, for example within systems, devices or activities performed by warehouse employees.

The assembly process is defined as a set of logistic operational and organizational activities, as a result of which the assortments and goods are set up in accordance with internal orders in the warehouse system, prepared on the basis of customer orders [2]. The completion process is all the activities related to the selection of specific storage locations or offering the appropriate number of items, as well as combining them into a separate whole, which will be subsequently transferred to the warehouse's issue zone and then delivered to the recipient.

In this article, the concept of e-store appears, or the so-called online store - this is a type of IT application that allows the sale of goods using the Internet. Currently functioning modern e-stores

are constantly developing thanks to dynamically developing technologies. "The development of e-commerce offered services is dependent on technical progress determining its capabilities and limitations, and these depend on the political, economic and cultural situation. The rules governing the online store market are analogous to those of traditional trade markets such as supply and demand, micro and macroeconomic factors." [3]. Online stores affect convenience and security. The basic elements of the e-store (on the company's website) include: header on the page, footers, product presentation, type of customer login system, system displaying new products and discounts.

Strategies and typical stages of the assembly process taking into account waste

The picking strategy is a holistic approach to handling multiple picking orders. The use of picking strategy appropriate to the circumstances is aimed at accelerating the execution of all orders [4].

The most popular picking strategies are:

- Classic one-pass picking - also called hypermarket picking. The person completing the order receives information about what goods are needed and where to collect them, visits subsequent orders in accordance with the guidelines at the disposal of competence.
- Multi picking - simultaneous handling of several picking orders. The employee collects two or three picking orders and completes each in a separate bin through one approach. Only the use of an IT system that would support matching of individual orders to each other will allow maximum overlap in the completion paths of jointly implemented orders.
- Relay - consists of handling one order by many employees who pass on a partially completed order.
- Parallel - in each zone the goods are picked into a separate carrier at the same time. If in the process of implementation we eliminate the simultaneous completion of individual parts of the order, we receive asynchronous completion. It is characterized by the fact that operations on individual parts of the order are temporarily independent of each other.
- Batch picking – it assumes the simultaneous execution of a larger number of orders into a common bin, which is successively broken down into individual orders.
- Two-stage picking is similar to the batch picking strategy, which is based on the simultaneous picking of multiple orders. Many employees who complete without a breakdown into orders take part in the process.
- Combination of indexes is a strategy for preparing shipping orders simultaneously handling all picking orders. The strategy becomes profitable if there is a high repeatability of the content of individual orders [5].

During the completion process the order picking in the warehouse can significantly affect the shortening of time and the proper performance of activities. There may be a waste in the process of completing orders. The goal of each enterprise is to pursue the maximum elimination of waste that may occur in the process [6].

We can distinguish 7 types of waste occurring in processes: waste of overproduction, waste of waiting, waste of transportation, waste of overprocessing, waste of inventory, waste of motion, waste of defects.

In the literature, there are several methods that can be used to determine the route to be followed by an employee in the warehouse during the order picking process. These methods are: S-Shape method, Midpoint, Return, Largest gap, Combined.

The most popular method is S-Shape which states that a warehouse worker moves between racks along a route similar to the letter S. The warehouse worker during the order picking process starts work at the starting point, where he collects the basket, then turns to the nearest starting point in which there is a needed part. If it finishes taking all parts from this alley, he goes toward its end and turns into a side corridor and enters the next alley.

All methods of routing the picking can find their application in the warehouses of various companies. In order to select the best one in a given warehouse, it is necessary to conduct appropriate tests to check which of the methods in given conditions will result in the shortest duration of the order picking process [7].

Spaghetti diagram as a tool to improve warehouse flows

Undoubtedly, every enterprise should constantly develop and improve its activities, as well as improve their quality, so that it is possible to do their job better, and this contributes to increased profits and reduced costs.

Lean Management puts the "slimming" of the company first, and one of the tools used for this is the Spaghetti diagram. It is based on observation and how the manufactured product moves.

The Spaghetti Diagram is a tool that allows you to visualize the path of a product/ service/ employee through the area in which a given activity is performed. First, you should get the layout of the area that will be analysed, e.g. a production shop floor. Layout, more precisely, is the spatial view regarding the arrangement of machines and the flow of materials. We have contact with the layout mainly in production plants and, what's more, it supports the implementation of the strategy and tactics of the company and is often called the graphic layout design of a traditional or electronic publication.

The person responsible for creating the spaghetti diagram path should follow, for example, the employee performing the activity to measure both the time and places of his stay. In this way, the places where a worker performs certain activities is marked with a line. In many cases creating such diagram indicates that employee makes too many unnecessary moves, which creates muda.

Based on the spaghetti diagram, we can make calculations determining the actual length of production paths, as well as the average speed of product flow. As a result, the losses that are a threat will be defined, as well as a way to eliminate the problem, for example, to shorten the material picking path you can move the warehouse or workstation - through such actions you can optimize the spaghetti diagram path. The changes introduced contributes to employee efficiency and productivity in the company.

The examples of the spaghetti diagram are presented on the figure below - Fig. 1. This example concerns the company Chrom Styl S.A, which is a chair producer. In the first figure with the red markings (on the left) it is able to observe the long route covered by the employee, which is caused by the workstations which are distant from each other. The research conducted in the company indicated that some of the workstations are unnecessary. Thus, changes were implemented and

afterwards the next diagram (figure on the right) shows a significant change in the path that the employee was to follow [8].



Fig. 1. Production process of desk components against the factory, state before and after

Source: <https://www.jakosc.biz/co-to-jest-diagram-spaghetti/>, 01.07.2020

Using the Spaghetti Diagram in a specific enterprise we have the opportunity to receive in a transparent and effective way a graphic scheme that shows problems in a specific production process. Thanks to this graphical representation of the route, it is able to observe where the losses occur - for example, picking up the goods after a long route, instead of moving the goods to the next, the closest workstations, the so-called "jumping" between such stations that were not adjacent. This is primarily a waste of time - muda.

What's more, it is worth mentioning that the Spaghetti Diagram, apart from being a cheap and quick solution, is easy to understand thanks to the graphic representation of the conducted research. Intuitive reading of indications allows to improve the processes occurring in the enterprise even for less experienced managers. This tool contains advantages that indicate that it is undoubtedly the proper Lean Management tool.

Analysis of the completion process in the enterprise X

For the purposes of the research, a research analysis was carried out at enterprise X operating in the Łódź Voivodeship. The company has in its offer all the necessary accessories for preparing home-made preserves including meats, wine, brewing, bakery as well as gardening accessories. Enterprise X is a leader on the Polish market of home-made accessories for wine, beer and other spirits, home-made preparations and cured meat. In Poland, the company serves many wholesalers and supermarkets, including OBI, Carrefour, Cash and Carry. On the European market in Central Europe it is the largest producer of thermometers, barometers and hygrometers. What is more, products are delivered to the United Kingdom, Germany, Russia, Latvia, Lithuania, the Czech Republic, Slovakia, Hungary, Romania, Estonia, France, Ukraine and Bulgaria.

Analysis of the completion process based on a randomly selected order

The purpose of the research is to analyze the correctness of the order preparation, which is received from the individual customer. The study concerned the completion of individual customer orders and involved the analysis of behaviors, activities and times as well as the path traveled during the completion of the order by the completing person. Moreover, this analysis was based and prepared on the basis of a randomly selected order on November 26, 2019.

Kompletacja zbiorowa zamówień

2019-12-26

nr dokumentu

3

Tabela 1.

Zamawienia składowe:

Ln	Objętość [m ³]	Waga [kg]	Ilość jednostek wysyłkowych	Rodzic referencyjny	Nr kumy	Objętość
1	36333/19	0,20768	0,33	2	13	
2	36333/19	0,00479	0,33	2	6	
3	36333/19	0,00497	1,45	2	7	
4	36333/19	0,00300	0,64	2	8	
5	36333/19	0,00271	0,55	2	12	
6	36333/19	0,00252	0,58	2	10	
7	36333/19	0,00298	0,43	2	4	
8	36333/19	0,00340	2,14	2	9	
9	36333/19	0,00328	0,53	2	1	
10	36333/19	0,13511	22,72	2	13	
11	36333/19	0,01334	3,59	2	5	
12	36333/19	0,00626	1,74	2	3	
Razem:	0,19218	35,11		47		

Ln	Objętość [m ³]	Waga [kg]	Ilość jednostek wysyłkowych	Rodzic referencyjny	Nr kumy	Objętość
13	36333/19	0,13511	22,72	2	13	
14	36333/19	0,01334	3,59	2	5	
15	36333/19	0,00626	1,74	2	3	
Razem:	0,19218	35,11		47		

DO referencji	Ln	Przebieg na mag	Stan mag Lokalizacja	Symbol	Nazwa towaru	EAN	J.M.	Ilość	PCR	Rodzic Ch. Ch.	Nr kumy	Nr referencji
do druk. 1	0	1 rat		DOS-TER-NIEDOTA	Okładka Brosz.	-	ks	1	-	-	7	36333/19
do druk. 2	0	1 rat		510609	Okładziny mylnik do pętkownicy - stacyjny	090418115822	ks	20	10	2	1	36333/19
do druk. 3	0	0 rat		KUR-POBR-DETAL	Kurter - podłama	-	ks	1	-	-	4	36333/19
do druk. 4	0	0 rat		KUR-POBR-DETAL	Kurter - podłama	-	ks	1	-	-	2	36333/19
do druk. 5	0	0 rat		KUR-POBR-DETAL	Kurter - podłama	-	ks	1	-	-	12	36333/19
do druk. 6	0	0 rat		KUR-PRZED-DETAL	Kurter - przedłama	-	ks	1	-	-	5	36333/19
do druk. 7	0	0 rat		KUR-PRZED-DETAL	Kurter - przedłama	-	ks	1	-	-	3	36333/19
do druk. 8	0	1 rat		POCZ-ODS-PUNKT	Pocztowa Poczta - odłamek punkt	-	ks	1	-	-	8	36333/19
do druk. 9	0	1 rat		POCZ-ODS-PUNKT	Pocztowa Poczta - odłamek punkt	-	ks	1	-	-	9	36333/19
do druk. 10	0	0 rat		INPOST-PRZED-DE	Inpost - paczomaty - przedłama	-	ks	1	-	-	6	36333/19
do druk. 11	0	0 rat		INPOST-PRZED-DE	Inpost - paczomaty - przedłama	-	ks	1	-	-	11	36333/19
do druk. 12	0	0 rat		INPOST-PRZED-DE	Inpost - paczomaty - przedłama	-	ks	1	0	-	2	36333/19
do druk. 13	0	201 rat		402191	Opaski gumowe TURBO GRON 40H 100L - 510g	090427710676	op	1	5	0,2	8	36333/19
do druk. 14	60	12 / 06		750105	5 STOPY Puchawki sztywnej na opisy - 40x4	090418046478	op	2	12	0,17	3	36333/19
do druk. 15	307	181 rat		751202	Kamionki dla pociągów - plastikowe, białe 17,8x17cm	090427717084	ks	1	10	0,08	6	36333/19
do druk. 16	307	181 rat		751202	Kamionki dla pociągów - plastikowe, białe 17,8x17cm	090427717084	ks	2	10	0,2	2	36333/19
do druk. 17	0	7501 rat		405070	Mieszarki cna - Stalowe 1000mm 35g	090427704137	ks	1	10	0,1	2	36333/19

DO referencji	Ln	Pokozenie na mag	Stan mag Lokalizacja	Symbol	Nazwa towaru	EAN	J.M.	Ilość	PCR	Rodzic Ch. Ch.	Nr kumy	Nr referencji
do druk. 46	3035	40452 rat		405584	Barkta termoplastyczna plastikowa MAU	090418016510	ks	35	10	1	1	36333/19
do druk. 45	5000_B	25 rat		401812	PROBACZNIK POTASU - 1kg	090427703234	ks	1	10	0,1	5	36333/19
do druk. 44	5008_B	1050 rat		660310	Korek nat. wale. P2200mm. Algierne - 100ut	090427704131	op	1	1	1	5	36333/19
do druk. 47	PACZKI	0 rat		660310	złota nitelarna Węgrzowice kar. 20,00mm - 15w	090418191815	ks	1	10	0,1	2	36333/19

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Przebiegiem

PACZKI - towary nie pobieramy, jest na paczkowni.

Opracował:

Fig. 2. Individual customer orders

Source: Own study

The analyzed order included 47 items of products to complete the order for 12 individual customers.

The order consists of 3 pages containing data on the location of products in the warehouse (symbol of location in the warehouse) - Fig. 2. The next data contained in the order is the theoretical current state of given item in the i.e. the number of items at the moment. Unfortunately, during the observation of the picking process in several cases it turned out that the data on stock levels (quantities on the shelves) are incorrect. In addition, it showed that the inventory level is not controlled in any way. "Safety Stock" is stock which prevents emergency stoppages in production. What is more, it is a kind of buffer that is used at the time of delays in delivery and execution of orders [9]. Safety stock is the quantity of warehouse goods that the company determines taking into account the type of goods, as well as the method of delivery to a specific place. Safety stock is established in order to protect the unit against undesirable influence of the surroundings and it is the

kind of reserve that should be satisfactory for the company from the moment of placing the order until the necessary elements are delivered.

Safety stock in company X should be monitored regularly so that the completion process is efficient. The observations indicated that this did not work in this way, which shows the negative effect on the overall order. In the examined enterprise, if a product is missing on the shelf in the main warehouse, usually, although not always, such items are left at the end and then there are two solutions:

- The person completing the order goes to the so-called "LIVING ROOM", which also stores some product groups that can be picked in the event of a shortage in the main warehouse. Therefore, if a given material is available in the LIVING ROOM, it is issued by the employees managing in this area and at the same time picked by the person completing it.
- Checking the availability of the product in an external warehouse located far away from the headquarters where orders are picked. This solution significantly extends the order picking path. Observation shows that waiting time for specific products delivered from this warehouse often takes a day.

However, if it is not in the main warehouse or in the LIVING ROOM, the next step is to supply the inventory. However, this is a very problematic situation due to the unknown waiting time for specific items and factors often occurring, also independent factors causing delay in delivery. Another thing included in the paper order is the product symbol and its name and EAN number. In turn, each item is assigned a unit and a quantity to be picked by the completing person. The next items included in the order are PCBs, the amount of bulk packaging, and also a fairly important element - the cuvette number. Each individual customer in the order is assigned the appropriate cuvette number to which the products from the order are being completed. In addition to the fact that each customer has a cuvette number assigned to them, he is also assigned an order number. The person completing the order receives a document with a collective order. This order contains a specific group of recipients to whom specific cuvette numbers from 1 to 12 are already assigned - Fig. 3.

Orders from customers flow into the system, then statements with collective orders are created. They are created based on the date of entering the system. Collective order is created only for 12 recipients, because there are 12 cuvettes. The cuvettes are located in a trolley that is used by the person carrying out the picking process.



Fig. 3. The trolley used by the person completing the order

Source: Own study

From the observations of the picking process in the examined company X, the person completing the order starts picking based on experience, i.e. if he knows the range and storage locations for specific goods, he sets his order of picking route based on this. The order described above was presented graphically using the spaghetti diagram tool. It is one of the Lean methodology tools that allows observation of product movement, consistent with the geographical distribution in this case of product storage locations in the workplace. The diagram is created by applying paths to the plant layout determined by the movement of the employee completing the order. Enterprise X for the purposes of the research provided a layout that served as the basis for creating a spaghetti diagram.



Fig. 4. Analysis of individual orders made using the spaghetti method

Source: Own study

The numbers from 1 to 12 are the order of the places where the completing person stopped or left the box trolley with cuvettes. For the purposes of the tests, the time of each of picking was measured using a stopwatch. The analysis of the diagram shows that the person stopped or left the trolley 12 times during order completion, and the entire completion process lasted 63 minutes - Tab. 1.

Tab. 1. List of picking process times - timing

Ordinal number	Time	Time of operations (time measured in minutes)
1	08:46	3
2	08:49	3
3	08:52	3
4	08:55	3
5	08:58	3
6	09:01	3
7	09:12	11
8	09:14	2
9	09:20	6
10	09:33	13
11	09:35	2
12	09:36	1
+	53 min	Order picking of items available in stock
+	10 min	Supplementing the articles in the „LIVING ROOM”
Sum	63 min	

Source: Own study

When the order is fully completed, it awaits in a specific place mainly for the quality control, but also quantitative compliance and product verification, i.e. whether the person completing the order has picked the right product, because sometimes mistakes can occur. In addition, during the control process the documentation is made in the form of photos (each product from the order is photographed so that the amount of goods is equal to the number of photos taken).

Suggestion of improvements and solutions - improper behavior while completing orders from the e-store

The analysis criterion concerned seven major wastes in the Lean Management concept. The most common muda, which appeared during the order picking process, was unnecessary movements. This was mainly caused due to the poor organization of the work methods of workers completing orders. Referring to the previously indicated types of picking strategies, choosing the right strategy increases the efficiency of order fulfillment. Enterprise X bases its activities on a multi-complement strategy, which consists in the simultaneous handling of several orders. Picked products are completed in one time, while each order goes into a separate basket. Enterprise X does not use any IT system that would support matching of individual orders to each other to achieve maximum overlap in the completion paths of jointly implemented orders.

Based on the observations during the tests, it can be concluded that the warehouse worker, when executing orders, relies on his own knowledge of the placement of goods in each of the warehouses located on the company's premises. At the time when the employee collected goods in the high-rack warehouse, the trolley was in front of the path with the shelves, in which he collected

a significant amount of materials. The consequence of the trolley further stopped in the same place was the extension of the time needed to collect materials from the shelves and put them in the cuvettes. The time spent on operations in this warehouse was 15 minutes - it was measured by the persons conducting the examination (9 times the path with the collected goods was taken to the trolley and back in the same place). If the trolley was introduced to the warehouse, the person completing the order could save at least 8 minutes in this way.

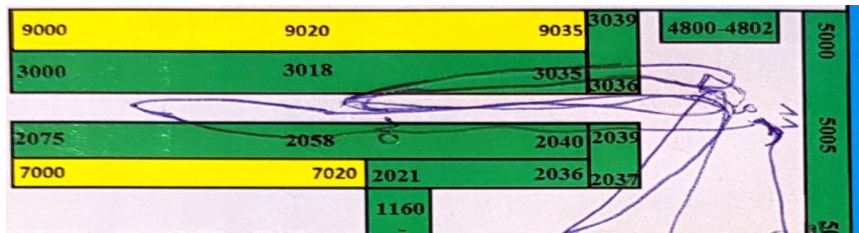


Fig. 5. Fragment of the spaghetti diagram - before changes

Source: Own study

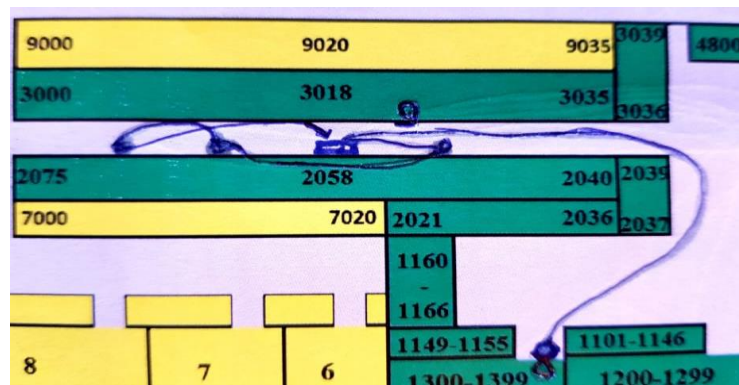


Fig. 6. Fragment of the spaghetti diagram - after changes

Source: Own study

When all the items from the order are completed, the order is put in a specific place and it waits for the stage of quality and quantity control, as well as checking the compliance of the type of collected materials. The person responsible for such control is obliged to document each item and quantity (take pictures). After inspection, the packages wait for protection and labeling with appropriate labels for shipment by the person responsible for it.

Based on our own observations, it can be concluded that there is another muda - the waiting time, resulting from the failure to replenish regular stocks in warehouses, as well as the lack of clearly defined safety stock and the way of signaling the emergency level (impending shortage in the rack). There are situations when some order is missing during order picking and then there is expected to move the item in a certain quantity from another warehouse. Referring to the idea of safety stock, if the company paid attention to it and implemented a technique that would help to indicate the level of inventory, then such situations would not occur. The fact that it is required to wait for the products until they are moved from another warehouse (external warehouse) means that the order is in the suspension phase and delays occur, and often chaos and unnecessary accumulation of too many different orders - mistakes may occur or after it may just be running out of space. Based on the observations, it can be stated that the company also does not have a clearly

defined division of the areas in which orders are to be stored. It would also be worth considering to divide the free space into areas due to the name of the supplier, for example supplier A - has the area divided into completed, under control and awaiting the completion of missing products.

Survey results

In the company X a survey was performed using questionnaire, which aimed to determine the level of knowledge of employees. It was addressed to the management and employees of the warehouse of the order picking zone. The survey questionnaire consisted of 6 questions in total. The number of respondents in the survey was 21, including 4 managers (3 men and 1 woman) and 17 warehouse workers (11 men and 6 women). The study used the method of convenient targeted selection by using an online tool - a questionnaire. Each employee received a message by an e-mail with a link to the questionnaire. At the beginning of the questionnaire, the respondents were asked to answer the question: What types of waste do you know in the order picking process?

Each managerial staff member listed all 7 types of waste that may occur in processes, and they were: waste of overproduction, waste of waiting, waste of transportation, waste of overprocessing, waste of inventory, waste of motion, waste of defects.

However, in the case of warehouse workers, 35.29% had knowledge of the types of waste, which accounts for less than a half. More specifically, they were able to list only 3 types of waste: waste of inventory, waste of motion, waste of defects. The remaining respondents did not mention any example - 64.71%. The survey results presented above indicate a low level of knowledge of the basic issues related to the completion process. Lack of their knowledge significantly makes the process of eliminating existing irregularities difficult.

In the next step, employees were asked to indicate the appropriate definition of the picking process. Referring to the survey result, 75% of managers answered correctly choosing the answer: "Completion is one of the activities included in the storage processes. The essence of completion consists in taking stocks from the storage zone in order to create a set of stocks in accordance with the assortment and quantity specifications for a specific recipient. Picking can take place in or out of the storage place". And 1 senior employee gave the wrong answer. Definitely more varied results appeared during the analysis of the results of warehouse workers. 71% of respondents answered incorrectly, and only 29% gave the correct answer. The low level of knowledge of warehouse employees, among others, can be proved by the fact that they have not been properly trained.

Select the correct definition of the assembly process.

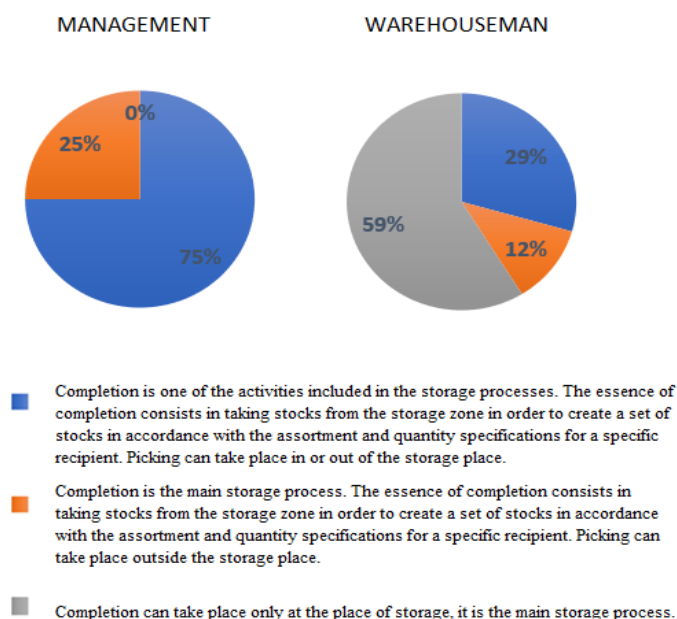


Fig. 7. Structure of the answer to the question: "Select the correct definition of the assembly process"

Source: Own study

In the next step, the respondents were asked to answer the question "Is the appropriate picking strategy appropriate for the circumstances?" Employees could choose answers from 3 variants, it was a multiple choice question - the answers were considered correct only if the respondent checked two correct answers (Tab. 2). All executives gave the correct answer, while warehouse staff provided the correct answer only in 35%.

Tab. 2. The distribution of answers to the question from the questionnaire: "Is the appropriate picking strategy appropriate for the circumstances?"

	MANAGEMENT	WAREHOUSEMAN
correct	100%	35%
false	0%	75%
ANSWERS		
correct	faster execution of all orders	
correct	achievement optimal order picking performance	
false	increasing the number of customers	

Source: Own study on permanent research

The next part of the survey is to examine the level of knowledge in the field of security inventory. The employees were asked to answer the question: "Do you know the concept of safe stock?". As shown in Tab. 3, each of the employee of the management team has knowledge about the safety stock. In the case of warehouse workers this result is 47%, which accounts for less than a half. Other answers indicated a lack of knowledge.

**Tab. 3. The distribution of answers to the question from the questionnaire:
"Do you know the concept of safe stock?"**

ANSWERS	MANAGEMENT	WAREHOUSEMAN
Yes	100%	47%
No	0%	12%
I do not know	0%	23%
I have no opinion	0%	18%

Source: Own study on permanent research

Another question verifying the level of employees' knowledge in this area was the question: "Does the enterprise X safety stock have a properly planned development system?" All respondents replied that the company did not have a clearly defined system determining the level of safety stock. This has a negative effect on all orders coming to the store, because delays are generated during the execution of orders, and this is due to the lack of a specific product at the time of completion. The extension of picking time increases the additional costs. When observing one of the randomly selected orders in company X, the same problems were identified that resulted from wastes during completing the order, and the lack of product was observed several times, which suspended the execution of the order.

The last question asked to the respondents was: "Does the company organize training on topics related to the picking process?". Warehouse management staff and warehouse workers unanimously replied that the trainings were taking place, however, their subject was very general. Issues related to waste or the correct determination of the level of safety stock have never been raised. Lack of professional training for employees in the field of optimization of the picking process and low awareness of the importance of having a system determining the level of stock is the main reason for problems during order picking. An example of such a problem is a randomly selected order, which was presented above and relates to suspension of completion - the order is waiting for the delivery of certain goods from the external warehouse to the main warehouse.

Summary and conclusions

The presented completion process characteristics and a detailed analysis of a randomly selected order indicated the range of the problems the company faces when completing orders. The increase in the number of orders, seasonality or pace of goods movement require systematic reorganization of warehouses and continuous improvement of all concurrent processes with completion.

In logistics, order preparation is the most important and the most difficult activity in which it is easy to make a mistake. For the proper functioning of the warehouse and continuous liquidity in the issue of orders is the implementation of the inventory control system, i.e. the so-called safety stock. Constant replenishment of the safety stock allows the company to prevent the reduction of muda and will create a kind of buffer when delays associated with deliveries or order processing occur. Safety stock is the basis and protects the organization against unwanted environmental influences. All mistakes made during the completion of the order may lead to the loss of the customer and generate additional costs. Graphical representation of the picking route using the Spaghetti Diagram

tool helps to optimize the warehouse worker's path, define losses that are a threat, and eliminate problems

Conducting the analysis of picking processes on the basis of a randomly selected order allowed checking the correctness of its execution and identifying a number of irregularities. The poor organization of the working methods of the employees responsible for the order creation process and the low level of knowledge of both the management and warehouse staff were also confirmed in the results of the employee survey.

The company does not conduct specific trainings in the field of optimization of the picking process. Little knowledge of the basic issues related to this topic make the process of eliminating the occurring irregularities more difficult, which is why delays are generated during the execution of orders, mainly due to the lack of a system informing about the need to supplement the safety stock of a given product.

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THE THIRD OPPORTUNITY OF POSTMODERNISM, THEORETICAL DESIGN OF A SINGLE-FAMILY HOUSE

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Abstract:

This article provides an analysis of circumstances which lead to the situation, when aesthetics stylistically referring to the idea of postmodernism is used in contemporary architecture. Using the example of a single-family house project, the author shows, that careful use of forms and elements originating from the history of architecture does not exclude the modern character of buildings created with their use. The presented original design of a single-family house designed according to postmodern aesthetics, as well as a post-modern space arrangement was used as an example and illustration. In addition description of the assumptions of postmodernism, with the differences in the development of this style in Poland and in the world is discussed. The article also presents the reception of postmodern aesthetics and describes possible use of these architectonical features in the upcoming future.

Keywords:

postmodernism, house design, architecture, postmodern aesthetic, specyfied space

Introduction

The reception of the aesthetics of postmodernism in architecture, understood as a return to the use of modified historicizing forms in designing process, has changed over the past years. Postmodernism initially associated with creative freedom of expression, rejection of the rigid logic of functionalism and unrestricted creation, today seems to be only one of the short, though significant episodes in the history of architecture. Postmodernism style in architecture is often criticized, sometimes without taking into account the specific conditions that influenced its overall image. Especially in Poland, where the development of postmodern style coexisting with the difficult transformation of the country's political system, postmodernism should be analysed as a broader phenomenon in Polish architecture and culture. However, it is still too early to treat the overall aesthetics of historicising postmodernism as a closed and finished phenomenon. This article, based on author's theoretical, architectonic design of a single family house is intended to answer the question: can the contemporary universal aesthetics of postmodernism be reused effectively in the design of buildings with a clearly contemporary character?

The beginnings of postmodernism– the first chance

The architecture of postmodernism is difficult to be clearly defined. This is mostly due to the fact, that postmodernism appeared and evolved as a trend contrary to the proceeding stylistic and ideological phenomenon – modernism [1]. Even the name „postmodernism” critically refers to its predecessor and expresses a polemic attitude to the assumptions of modern style. Modernism in its various forms successfully dominated the design methods of 20th-century architects and permanently changed the design principles in the world. Over time, however, the impetus of the large-scale modernist revolution in architecture and urban planning weakened. One can say, that on simple, yet noble “facades” of pure, modernist ideas, deep cracks and scratches began to appear. Radical measures forced to implement modernist assumptions relatively quickly, already in the sixties of 20. century, were confronted with their fierce critics. In the United States one of them was Jane Jacobs with her book – „The Death and Life of Great American Cities” [2], mercilessly pointing out the disadvantages of modernist urban planning in the cities of the United States, implemented in its caricature form as a result of development of American capitalism. Another pair of critics, who are probably known as the most vigorous contesters of the idea of modernism, were architects and theoreticians of architecture – Robert Venturi and Denise Scott Brown. Their extremely critical theories were presented in the book „Complexity and Contradiction in Architecture” and the subsequent groundbreaking position „Learning from Las Vegas” [3]. As seen from today’s perspective they can be considered key contributors of shaping a new style of design – i.e. postmodernism. It would be wrong to attribute early criticism of modernism only to American architects. In this field, the European continent was effectively represented by an Italian architect Aldo Rossi [1]. Ideas of postmodern pioneers fell on quite fertile ground and have developed in the seventies virtually in the entire urban world. The previously expressed criticism of the commercial dimension of late modern architecture did not, however, prevent the creators and further authors of postmodern style from using it intensively for designing representative buildings – headquarters of large companies and corporations. A striking example can be, for example, the AT&T building (1980-1984) in New York, already iconic for its style, designed by Philip Johnson. Despite promising beginnings, Postmodern architecture quickly became a victim of its own success and its features, contrasting earlier constructed cuboid, simplified, modernist office buildings. This trend relatively quickly drowned in a flood of more or less successful projects, where in addition color was extensively used. Postmodernism has found its way and defeated successfully its values only on an urban scale, where valid theories of design adapted to human curiosity and human scale did not lose much of their values. As presented briefly above at that time Postmodernism in world architecture got its first chance and used it as much as it was only possible.

The second chance - postmodernism in Poland

While the multitude of postmodern expression found its best ground in the West, in Poland and in other countries of the Eastern Europe, it had very limited chances even to appear. The political situation and the dependence of the Polish People's Republic on the Soviet Union in all areas of life, including architecture and art, did not give enough space for the development of postmodernism, which was recognized by the government as a style representing decadence of the West and

capitalism. In Poland, the seventies were spent on attempts to satisfy the huge housing shortage through large-scale housing programs based on the prefabrication of structural elements. In addition, a political system excluded private investments in practice, therefore there was not much space left for other architectural projects. Of course, some public buildings with high architectural value were also built at that time, nevertheless, these were rather exceptions. Given the circumstances, successful attempts to apply postmodern aesthetics and ideas in Poland should be all the more appreciated. Individual projects from this period in fact represented a much higher value than later postmodern buildings constructed after 1989, when the political and socioeconomic circumstances had changed [4]. However, their impact and influence was still very limited in the country. From a Polish perspective, postmodernism got its real second chance with the fall of communist order in 1989. However, the rapid opening of the market of the former Eastern Block countries, has become a source of new architecture of relatively low quality. Enthusiastic, but also unreflective import of solutions from the West could not lead to satisfactory results. The uncontrolled transfer of formal solutions already well known in the world, but still associated with novelty and freedom in the post-communist reality had disastrous effects on the aesthetics of Polish cities. Although their appearance of towns and cities influenced by years of communistic reality did not represent a particularly high value at that time, some kind of forced consistency was indeed visible. With the effects of political and economic transformation, the second incarnation of postmodernism has already passed forever. A number of factors influence today's negative perception of postmodern aesthetics. These include poor quality of workmanship, limited availability of materials and technologies, copying ready-made solutions that were not adapted to Polish conditions and inadequate care of existing buildings. Also, playing with the context and historical forms, by the creators what was either not understood or not appreciated widely, was very significant. The last factor is the opinion of outdated, kitschy and widely mocked style [5]. All this led to the fact that the second chance of postmodernism ended in a failure in Poland. In this somewhat sad conclusion, it would not be fair to forget about good examples of projects maintained in the style of Polish postmodernism, which bravely stood the test of time. There are several examples and among them three may be mentioned here, these are: The Higher Seminary "The Road of the Four Gates" created by the architect Dariusz Kozłowski in Krakow in the years 1983-1988 or the Library of the University of Warsaw by architect Marek Budzyński (Warsaw 1993-1999). It is also worth mentioning here the intriguing projects of an architect Stanisław Niemczyk, such as the church of Divine Mercy in Krakow (1990) [6]. And although Stanisław Niemczyk, recently deceased, refused to be called postmodernist, "his attitude to the past and modernism allows him to be placed in this trend" [7].

Contemporary postmodern house

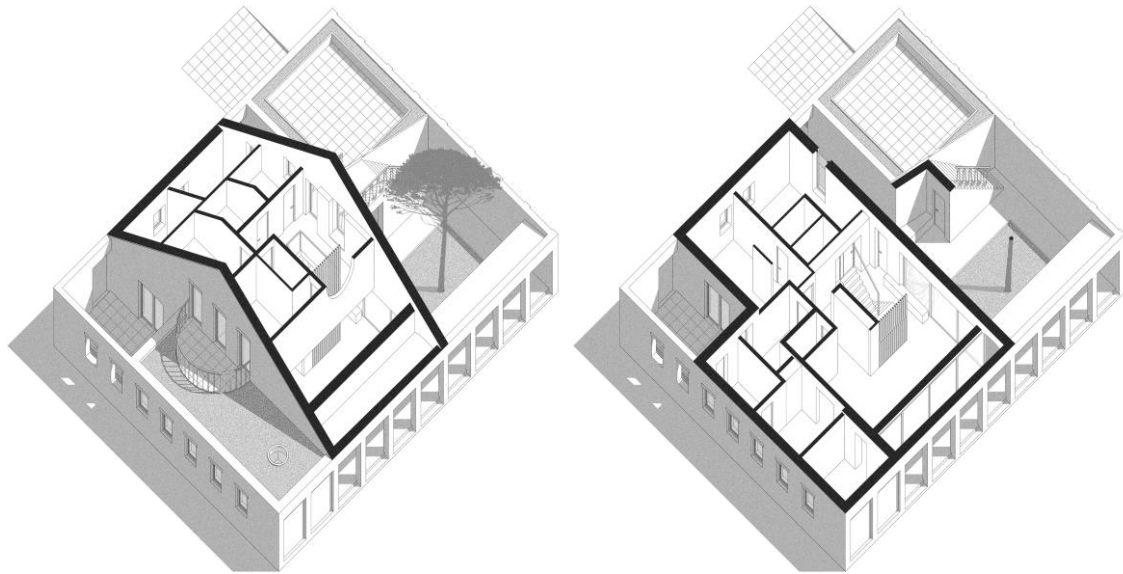


Fig. 1, 2. Axonometric sections

Source: Author archives

The presented concept of a single-family house using elements of postmodern aesthetics was created as a kind of a theoretical experiment, but it is limited by the guidelines for designing residential houses in Poland. The existing restrictions are not only the provisions of the construction law, but also an attempt to create a building that universally respects the most popular features of typical suburban development plan. It is also important to try to fit the designed house into the almost always chaotic context of the place of future construction. The character of the building must therefore be as universal as possible. In the described project, this is achieved by the plan of the house, which, together with adjacent spaces of various functions, fits within the outline of a rectangle with 4:5 aspect ratios. The theoretical aspect of the design allows for a treatment of the building's location in a model way, relative to the world sides, respective solar exposure and the expected availability of daylight in residential interiors. As far as the organization of the space of the presented house is concerned, postmodern theories have been realized in the separation of interpenetrating functional zones. A completely free plan promoted by Le Corbusier is not reflected inside the house. One can rather find an analogy to Raumplan (1922) - the theory of functional interior division initiated by Adolf Loos, whose design has had a strong impact on the Italian postmodernist Aldo Rossi mentioned earlier [8]. Adolf Loos clarified his vision of Raumplan long before postmodern architects formulated their theories. This Austrian architect was also ahead of his time in other areas. Today, he is associated mainly with the catchy title of his manifesto „Ornament and Crime” (1913) [9], the content of which may give the impression of completely opposing the postmodern vision of architecture. However, this does not change the fact, that the way the space is divided in his outstanding modernist projects of the Müller's villa (Prague, 1928-1930) and Tristan Tzara's house (Paris, 1925-1926) can be a valuable inspiration, also in projects that negatively assess the assumptions of modernism. In this situation we can even find a kind of irony, typical for and fancied by postmodernists. Adolf Loos used to "arrange surprise" in his projects [10], he also

claimed that "the house is to be a stage to play the great drama of life" [10]. A certain degree of theatricality of the designed spaces can also be attributed to the architecture of buildings designed by Polish architect Stanisław Niemczyk, named by Anna Cymer as a "medieval postmodernist" [7]. Stanisław Niemczyk has designed characteristic entrance area in the project of the primary school in Katowice in district of Giszowiec (1990-1993). This is how Anna Cymer, a Polish researcher of postmodern architecture, describes it: "The main entrance to the school was visually cut off from the surroundings - they were girded with a brick rotunda constituting the sluice between the prefabricated housing estate and the school space" [7]. A similar way of dividing the space and creating places with a very specific character was also used during the design process of the described single-family house. I would claim, that this can be described as postmodern one.

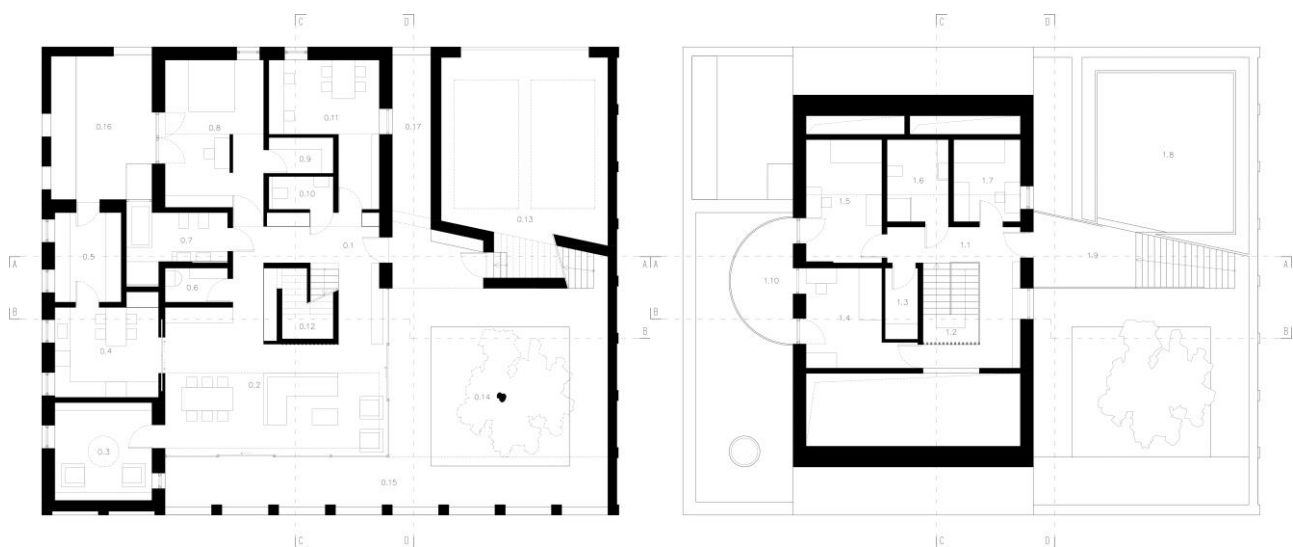


Fig. 3, 4. Ground floor plan and first floor plan

Source: Author archives

Using the above-mentioned ideas in the design of the presented house, results in a functionally complicated program intended to serve the key residential functions. Two courtyards are attached to the building: a larger one, semi-public, extending the house entrance area and a smaller one, providing privacy to residents and accessible also from the master bedroom. The program is also complemented by a garage fitted into the building outline, designed in the way that allows its transformation into an independent 50-meter residential or commercial space. Such flexible solutions used to accommodate a possible, potential changes in designed functions are particularly important taking into account questions about the future use of designed spaces and also the limited resources of our planet. The designed garage is connected to the main solid of the house by external stairs, which at the same time provide roofing of the entrance area and forms a strong formal accent, visible due to small scale of the building. The flat roof of the garage serves as a terrace for use and is surrounded by flowerpots integrated with its structure. The whole complex is completed by a longitudinal gallery situated on the south side, closing a rectangular arrangement of solids and voids. The composition of external and internal usable spaces complements each other and may resemble a section of an organically growing quarter of buildings in an ancient city. The reference to historical urban planning was also the domain of postmodernists, including Leon Krier - an

architect who literally postulated a return to historical urban and formal solutions [11]. When designing the spatial layout of a postmodern home, it is important to create spaces called "corners" - places that catch the user's attention with their often unobvious character, appearance or function. An example of the implementation of such deliberately designed „corners” can be a bench near the entrance to the house inspired by the home of the architect Oskar Hansen in Szumin (1968) [12] or a wall with a small square library window, closing a gallery with a slightly arched vault. On the scale of the interior of the building, a semicircular window connecting the entresol with the high space of the living room or the interior of the library designed in cube proportions, illuminated by a circular skylight centrally located in the ceiling should be considered as an example of such „corner” place.

The house full of quotes

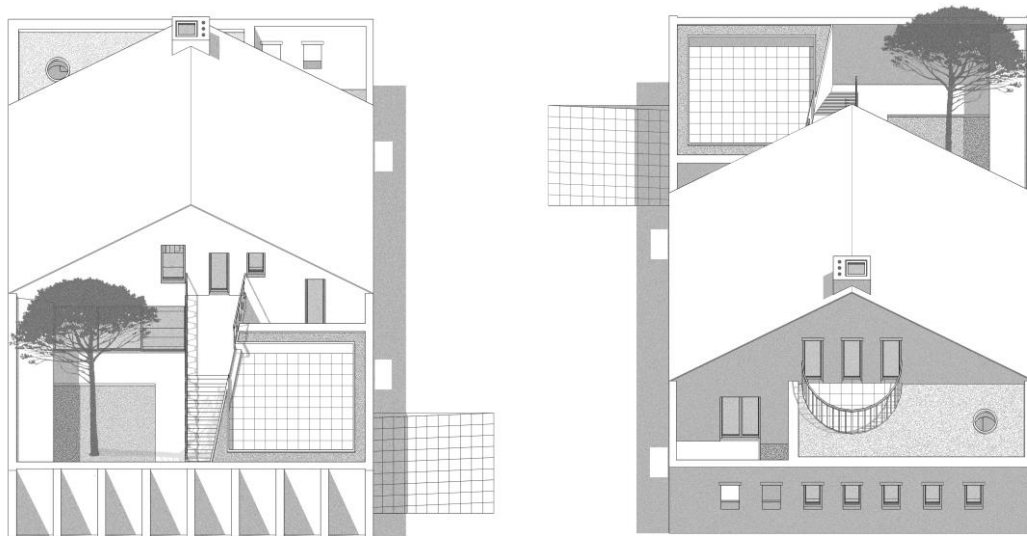


Fig. 5, 6. Axonometric views

Source: Author archives

It would be difficult, as well as surprising to consider the use of postmodern aesthetics, while avoiding quoting the forms that have occurred throughout the history of our civilization. After all, everything has already been done and nothing new in architecture will happen again, so we have to use existing solutions, as postmodernists with Robert Venturi claimed [4]. The house design using postmodern aesthetics naturally has to use clearly visible references to previously known forms. The form of the house does not create an impression that attempts were made so the house would appear as a new structure or object, never seen before. Instead of surprising its audience with its alleged novelty, it tries to catch the attention of the attentive user in subtle and delicate ways. In the previous part of the article the postmodern character of space has already been described. It is complemented here by more or less literal inspirations with forms and buildings, which are placed in a new context and equipped with new functions, and can surprise again. The first and the most visible of such historical borrowings is the shape of the building's roof. The symmetrical covering brings to mind the classical example of American postmodern style - the house of Vanna Venturi

(Philadelphia, 1959-1964). That small building by Robert Venturi is sometimes called the material manifesto or "foundation" of postmodernism [13]. Another example of a house, which in a spectacular way is drawing on the aesthetics of postmodernism is Casa Zermani (Varano, 1997) by Italian architect Paolo Zermani [14]. It should be mentioned here that it is the sloping, gable roof required by the provisions of local spatial law often wrongly appears as the biggest problem in creating architecture of a modern nature. Apart from the shape of the building, the material of the external facade is also key to its reception. It was designed with brick - a material that is associated with tradition, but gives great opportunities for contemporary arrangement. A great example of the possibility of a modern and sophisticated use of brick is "The Red House" in Rudy Wielkie (2017), designed by the architectural studio Topprojekt [15]. Another clear reference to historical spatial solutions is the southern facade of the house designed in the form of an arcade limited by a rhythmic row of brick columns. This solution allowed the resignation from the overhang hood with the simultaneous preservation of all its advantages. Brick columns forming an openwork partition soften the transition between the interior and surroundings of the building, and the gallery they create is a direct extension of the living area of the house. The internal atrium as a partially separate space for household use is also a classic inspiration. This space was designed as an extension of the living area of the house, as well as a place of residents relax. Communication routes of the house users meet in the atrium area, thanks to which the courtyard, sheltered by a tree situated in the middle, becomes a natural meeting place for the household members. The way from the described courtyard to the first floor or terrace above the garage leads up the stairs, the shape of which refers to the monolithic solid of Casa Malaparte (A. Libera, Punta Massullo, 1937) [16], great house which is adorning the coast of the Italian island of Capri. From the height of the small footbridge connecting the stairs with the hall upstairs, the complexity and changeable nature of the ground floor development is clearly visible. The interior architecture of the building is based on the use of elementary shapes and solids. Among the orthogonal arrangement of the interior, the motif of a circle or semicircle is repeated several times. This motif can be found in a kind of balcony imitation, in fact being a separate part of a flat roof above the ground floor of the building. The skylight of the library, visible from the balcony of the bedroom, also uses the form of a circle. A similar arrangement, which through the play of light and a circular skylight shape highlight the uniqueness of the particular place, can be found in the reconstruction of the Neues Museum by David Chipperfield. (Berlin, 1997) [17]. Another examples include the building of the New Guardhouse in Berlin (K. F. Schinkel, 1816-1818, reconstruction H. Tessenow 1930-1931), which serves as a memory monument, or even the noble progenitor of this kind of a formal arrangement - the Roman Pantheon (125 CE). The external facades of the building are subordinated to the rhythm, symmetry and character of the brick material. The southern facade hides behind a rhythmic row of columns and a covered gallery, while the western facade also contains rhythmically arranged windows and pretending openings leading to a private terrace. The spreading triangle of the gable wall with a semi-circular terrace railing is a culmination of this side of the building. The symmetric situated chimney is visible over the edge of a roof. To the east, from the side of the potential street, the building has the form of a homogeneous brick wall separated by slightly sloping counterforts. It is a stylistic reference to a hall of the Moritz Milch sulfuric acid factory (Luboń, 1908-1911), a bit

forgotten, but still very impressive industrial building. It was designed by Hans Poelzig, whose synthetic style of design and masterful use of the brick material, deserves a wide respect.



Fig. 7. East elevation partial view, graphic representation

Source: Author archives

All the references, quotes and historical borrowings mentioned above can be treated as a synthetic attempt to use postmodern aesthetics in a contemporary architecture. Despite the different sources of the used forms, using them together in one project constituting an entity with a specific function shows their universalism. This prompts us to reconsider the value of the often ridiculed canon of postmodern formal solutions (which, after all, are not postmodern in themselves). Skilfully applied references to commonly known and universal forms allow us to adapt to the chaotic surroundings, which in the great majority of cases do not have its own character or strong context. Properly used stylistic forms can establish a dialogue with the surrounding, instead of strictly evaluating it and ridiculing all its disadvantages. What's more, I believe that architecture understood in this way can even make an organic attempt to organize its surroundings and give it an undiscovered value. Not by its radical contestation, but by showing to it the right direction for development.

Third chance of postmodernism

While observing architectural discussions and contemporary designs, one can get the impression that despite its bad reputation, the postmodern style has managed to survive in the minds of working architects, but in an altered, slightly simplified as well as polished form. I can even claim the opinion that the catalog of forms referring to historical solutions, like arches, vaults, delicate cornices, arcades or even porticoes used in accordance to postmodern aesthetics is more and more boldly present in contemporary projects of renowned architectural studios. Of course, analyzing current or upcoming trends in architecture does not yet provide a proper perspective for assessing these phenomena. Nevertheless, I believe that the return of aesthetics referring to the idea of postmodernism is slowly becoming a fact. What is still missing to be able to fully proclaim its

re-use is the lack of the characteristic irony in the ideological layer of the projects, without which, unfortunately, architecture too often falls into a kind of pathos. At the same time, the growing interest of researchers in postmodern theories and existing implementations of its assumptions can be observed. In Poland this is evidenced by the returning disputes about the future and attempts to protect e.g. the controversial building „Solpol” (W. Jarząbek, 1992-1993) in Wrocław. A positive example of the study of postmodern heritage is the use of the entire issue of the magazine *Autoportret* [19], published by the Malopolska Institute of Culture, or even the book „Architecture of a seventh day” published in 2016 [20], accurately documenting post-war examples of sacral architecture. The list of examples of interest in the heritage of postmodernism is also supplemented by the internet project called "Pomoszlak. Architecture of postmodernism in Krakow", started by the Krakow Institute of Architecture. With some hope, I consider the return of postmodern stylistics as an attempt to react to the problems faced by architecture today, as it happened at the very beginning of this stylistic movement. Universal postmodern architectural models are permanent and the elementary meaning of their metaphor and form is constantly renewed. This means, that postmodernism still deserve its third chance.

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RESISTANCE TO OXIDATION OF DIESEL OILS AND METHYL ESTERS OF RAPESEED OIL FAT CONTENT

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Abstract:

Due to the persistently significant number of diesel oil samples checked by UOKiK and not meeting quality requirements in terms of oxidation resistance, it was appropriate to test this parameter. The purpose of the work was to determine the oxidation resistance of diesel oil, rapeseed oil fatty acid methyl esters and mixtures thereof. The samples were tested for baseline parameters and then exposed to oxygen, light, heat and water for 16 weeks. The determination was made based on the PN-EN 16091: 2011 standard, using the PetroOxy device. The work contains information on the aging process with particular emphasis on oxygen from the air, a description of the oxidation processes of fuel and its determinants. The final result is the conclusions that oxidation significantly degrades the performance of the fuel.

Keywords:

oxidation resistance, oxidation, PetroOxy

Introduction

Oxidation resistance is still a visible problem at many gas stations in Poland. In connection with the annual reports prepared by the Office of Competition Protection and Consumers (UOKiK) clearly shows the problem of the fact that diesel fuel samples (ON) do not meet many parameters. The most common parameter that does not meet the quality requirements according to the Regulation of the Minister of Economy on the quality requirements for liquid fuels is oxidation resistance, which is also directly related to the aging of the fuel. Hence, the storage time and irreversible deterioration of the fuel's performance. It is possible to accelerate and slow down the oxidation process, but it can not be completely inhibited. During many logistic processes, fuel, such as transporting from a refinery to a fuel base and from a fuel base to a gas station, storage and use irreversible changes occur in its composition.

There are many theories for the oxidation of petroleum products in literature. The oxidation process has its origin during the formation of peroxides and hydroxides. They participate in the formation of secondary oxidation products, which are aldehydes, high molecular weight fatty acid oligomers and low molecular weight organic acids which, as a consequence, block fuel filters or fuel injectors [1]. Factors influencing the course of fuel aging are internal factors (directly related to

the chemical composition of the fuel, primarily the content of aliphatic or olefinic hydrocarbons) and external factors (e.g. antioxidant additives, tank breathing system, tank roof type, tank type, amount of microorganisms, moisture from the air, heat, evaporation surface, catalytic action of metals, multiple logistic operations).

Numerous studies on oxidation resistance show that there is a big problem in terms of not meeting the quality requirements of this parameter. K. Biernat examined the samples over a period of two years [1]. J. Jakubiak and A. Ambroziak performed a study on the change in peroxide number depending on unfavorable storage conditions over a period of 2, 4, 8 and 12 weeks [2]. Skolniak and Bukrajewski studied the impact of storage time on ON [3]. They also showed a significant effect of the content of rapeseed oil (RME) fatty acid methyl esters in a mixture with ON on its oxidation rate, especially at RME concentrations greater than 5% vol. Similar studies are described in [5]. The effect of copper on oxidative stability was also investigated [4].

Aging can be countered at various stages of the logistics chain. The producer in the refinery is obliged to produce fuel in accordance with the applicable requirements and has an impact on its production process. In the fuel base, employees should ensure the frequency of tank cleaning, tank tightness, technological installations and the parameters of stored fuels in terms of their deterioration. The last stage in the distribution chain before being released to the final customer is a petrol station. There, the greatest changes in fuel properties occur. Confirmation of compliance with the requirements of fuel brought to the service station is the quality certificate, which is handed to the station manager by the driver. Despite the fact that the fuel meets the requirements, it mixes with the remaining fuel in the storage tank and changes its properties. Failure to observe the frequency of drainage and cleaning of tanks as well as uncontrolled presence of microorganisms results in deterioration of properties and negative results of fuel quality control conducted by UOKiK. A customer buying fuel at a service station has no influence on the fuel parameters. He is often unaware that the fuel may not meet the quality requirements imposed by the state.

In connection with this constantly growing problem, the oxidation resistance tests of diesel oil, RME and their mixtures have been carried out, described later in this article.

Research

Two types of fuel were used for testing: Ekodiesel Ultra Bio diesel oil (ON) and rapeseed oil fatty acid methyl esters (RME) (Fig. 1) and their mixtures (20% RME + 80% ON and 50% RME + 50% ON). A total of sixteen samples were tested. The samples were subjected to selected factors, and finally tested for changes in oxidation resistance in accordance with the requirements of the standard [6]. In order to check the changes of other parameters, the kinematic viscosity [7], density [8], cold filter plugging point [9], cloud point [9], flash point [10] and sediment content [6] were additionally examined. The samples were subjected to the following factors over a period of 16 weeks:

- in a sunny place (Fig. 2),
- in a place without access to light (Fig. 3),
- with the addition of 2% water (Fig. 4),
- no water content, no access to light (Fig. 5).



Fig. 1. Fresh samples ON and RME used for testing
A-RME fresh, B-50% RME + 50% ON fresh, C-20% RME + 80% ON fresh, D-ON fresh
Source: Own picture



Fig. 2. ON and RME samples used for testing
1-RME + light, 2-50% RME + 50% ON + light, 3-20% RME + 80% ON + light, 4-ON + light
Source: Own picture



Fig. 3. ON and RME samples used for testing
5-RME, 6-50% RME + 50% ON, 7-20% RME + 80% ON, 8-ON
Source: Own picture



Fig. 4. ON and RME samples used for testing
9-RME + 2% water, 10-50% RME + 50% ON + 2% water, 11-20% RME + 80% ON + 2% water, 12- ON + 2% water
Source: Own picture



Fig. 5. ON and RME samples used for testing
13-RME + 2% water + light, 14-50% RME + 50% ON + 2% water + light,
15-20% RME + 80% ON + 2% water + light, 16-ON + 2% water + light
Source: Own picture

The fuels used for the tests had quality certificates confirming their basic properties (Tab. 1). Samples were filtered before aging. Pollution determination made, and then the samples were placed in glass containers filled with a 50% sample. After a period of 16 weeks, they were tested for oxidation stability and changes in selected parameters.

Tab. 1. Selected basic parameters of fuels used for research

Lp.	Parameter	Denomination	RME	ON
1.	Content of fatty acid methyl esters	%(m/m)	97.3	0.0
2.	Total impurity content	mg/kg	3.3	10.0
3.	Sulfur content	mg/kg	< 3	7.3
4.	Cetane number	-	52.0	52.5
5.	Investigation of corrosive action on copper plates	-	class 1a	class 1a
6.	Oxidative stability at 140 °C	min.	29.77	102.42
7.	Density at 15 °C	kg/m ³	882.5	838.5
8.	Kinematic viscosity at 40 °C	mm ² /s	4.50	2.86
9.	Flash point closed cup method	°C	179.0	65.5
10.	Cold Filter Plugging Point	°C	-15	-2
11.	Cloud point	°C	-3.6	-4.5

Source: Basic results No. 1-5 based on the quality certificate: RME (quality certificate No. 1A / E / 2017), ON (quality certificate No. 17BMK / A / 1530), item number 6-11 own source

Findings

The oxidation resistance test performed using the PetroOxy device consists in subjecting the sample to elevated temperature (140 °C) and oxygen at a pressure of approximately 1000 kPa. The device is filled with oxygen from the cylinder twice to obtain a pressure of 700 kPa. After that, the sample is heated to the test temperature of 140 ± 0.2 °C, which is directly related to an increase in pressure to about 1000 kPa. The test ends when the pressure in the reaction chamber drops by 10% of the maximum value. This decrease is related to the oxidation of the sample. During the test, a graph (Fig. 6) is created of the change in oxygen pressure in the reaction chamber during the test. During the oxidation stability test, mixtures of RME and ON were used to check the effect of ON content on the extension of the oxidation time.

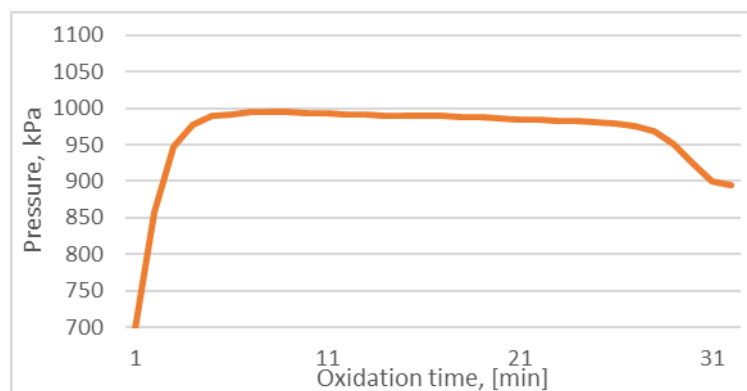


Fig. 6. Change of oxygen pressure in the PetroOxy chamber during the oxidation test of fresh RME sample

Source: Own study

During additional tests of basic fuel parameters, it was possible to notice that the content of 2% water together with the access of light caused the formation of the largest amount of sediments (lp.16 in Tab. 2), this is probably related to the development of microorganisms. The most sediments were observed for the RME sample, the least for ON. Light darkens diesel fuel, while RME samples vice versa. Commercial diesel oil turned out to be the least light-resistant fuel and differs significantly in terms of deposits. This may be due to the fact that the storage tank at the service station had remnants of earlier supplies, which could have worsened the fuel parameters. Therefore, the fuel obtained could slightly differ from the parameters given in the quality certificate. The oxidation resistance parameter should be read as follows: the shorter the oxidation time in the PetroOxy, the lower the oxidation resistance is. The ON sample had the longest oxidation time, which is associated with a lower content of multi-chain hydrocarbons. The smallest and thus the sample with the most significant changes is the RME sample. Tab. 2 clearly shows a decrease in oxidation stability of all samples after 16 weeks of adverse storage conditions. For RME samples and mixtures containing ON, a correlation between sediment content and reduction of oxidation resistance is visible. The density changes at 15°C in the tested samples are mostly within the measurement uncertainty of $\pm 0.5 \text{ kg/m}^3$. For some samples exposed to light or light in the presence of water (e.g. 50% RME + 50% ON, RME or 80% ON + 20% RME) the differences range from -0.6 kg/m^3 to $+0.9 \text{ kg/m}^3$. The exception is the RME sample with access to light and a 2% water content, whose density has increased by 2.1 kg/m^3 . For most samples, differences in kinematic viscosity at 40 °C are within the uncertainty of measurement, except for three samples: RME, 50% ON and 50% RME (with access to light) and ON (with access to light and water content). In the case of blocking temperature of the cold filter and cloud point of all tested fuel samples, the observed changes are within the uncertainty of measurement.

Tab. 2. Test results of selected parameters of samples of tested fuels after 16 weeks of aging

Sample	Sediment content [mg/dm ³]	Oxidation resistance [min]	Flash-Point [°C]	Cold Filter Plugging Point [°C]	Cloud Point [°C]	Kinematic viscosity 40°C [mm ² /s]	Density 15°C [kg/m ³]
1.	15.9	17.60	171.5	-15.0	-5.4	4.56	882.5
2.	9.5	17.46	84.5	-6.0	-2.7	3.67	860.7
3.	15.8	17.25	73.5	-3.0	-4.5	3.21	847.4
4.	40.0	22.14	69.0	-4.0	-3.2	2.96	838.8
5.	5.8	28.05	175.0	-14.0	-5.6	4.53	882.0
6.	3.3	40.00	83.5	-7.0	-2.9	3.60	859.2
7.	3.0	52.80	73.5	-2.0	-3.6	3.20	847.0
8.	2.1	69.66	68.5	-5.0	-4.3	2.98	837.4
9.	36.5	27.01	178.0	-15.0	-5.5	4.53	882.1
10.	1.9	37.50	85.5	-9.0	-2.1	3.60	859.2
11.	8.4	48.31	75.0	-3.0	-3.4	3.18	847.2
12.	17.1	74.03	69.5	-4.0	-3.4	2.98	837.5
13.	68.8	6.78	175.0	-15.0	-5.2	4.75	884.6
14.	68.4	18.33	86.0	-7.0	-2.0	3.61	860.7
15.	24.7	15.87	75.0	-4.0	-3.6	3.22	846.4
16.	106.4	20.65	70.5	-4.0	-3.9	3.05	837.9

Source: Own study

For the RME-1, RME-2, RME-3 samples, the increase in oxidation stability relative to the amount of diesel added is clearly visible (Fig. 7). For RME-4 and RME-5 oxidation resistance slightly increased despite the addition of oil.

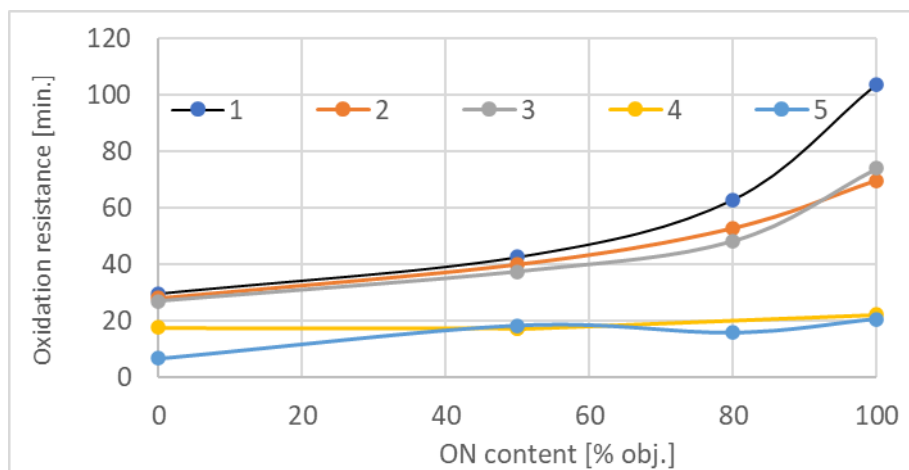


Fig. 7. Dependence of oxidation resistance of RME and ON mixtures on ON content

1 - fresh RME sample, 2 - aged RME sample, 3 - aged RME sample with added water, 4 - aged RME sample with light access, 5 - aged RME sample with light access and water addition

Source: Own study

Conclusions

The obtained results confirm the research cited in the literature part. Based on the research, the following conclusions can be drawn:

1. Increasing the diesel content in samples of mixtures with RME (fresh), RME (after aging) and RME (with the addition of water) results in a significant improvement in oxidation resistance.
2. Water content with simultaneous exposure to light significantly deteriorated the oxidation resistance of RME and mixtures containing diesel oil.
3. Oxidation resulted in sparingly soluble gum deposits during 16 weeks of aging. The water content and the effect of light on the samples of tested fuels determine the amount of formed sediments (insoluble filterable and adherent). RME is the least resistant to the formation of insoluble filterable sludge and ON to insoluble sludge.
4. After a period of 16 weeks of aging, the tested fuel samples with the exception of rapeseed oil fatty acid methyl esters increased their flash point and kinematic viscosity at 15 °C, in the majority of tested samples the density at 15 °C decreased and the temperature of blocking the cold filter and the cloud point of all tested fuel samples remained virtually unchanged.

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DISCRIMINATION IN THE PEER GROUP AS A CRUCIAL SOCIAL ISSUE IN THE MODERN WORLD

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Abstract:

The article responds to the constant need to pay attention to the problem of discrimination and peer exclusion, which are commonplace in peer groups. The paper refers to the definition of the basic terminology of the subject matter. It discusses the relationships between the specificity of peer groups, their structure, hierarchy and position in it, and the genesis of the problem of discrimination. In the context of the group's analysis, the problem of characteristics in the individual dimension is also discussed in the context of the roles occurring in a discriminatory situation, as well as the tendency to initiate it. The article aims to enable easier analysis of the structures of individual peer groups by educators, carers or teachers by making them aware of the importance of their roles and the positions occupied by individual members in those groups.

Keywords:

discrimination, peer group, peer exclusion, scapegoat

Introduction

The aim of the article is to draw attention to the problem of discrimination in the peer group, which is a common phenomenon among children and young people. It is essential to direct teachers and supervisors of peer groups to factors determining the problem. It is important both from the perspective of the structure of peer groups, as well as in terms of the analysis of individual conditions concerning strictly group members performing specific roles in discriminatory situations. At the outset, we have assumed that it is reasonable to recall selected definition arrangements of the basic terminology. It should be stressed that more than one person can stand under the phrase "discriminating person" or "torturer".

Definitions

Therefore, discrimination is understood as 'not only passive isolation or avoidance, but active, inferior treatment of members of a foreign group' [1]. It is conditioned only by belonging to the group of superstition, without individual qualifications and merits. The long-term and systematic character of this phenomenon is indicated, which contributes to a certain extent to preventing the satisfaction of needs and achievement of required values [2].

Sometimes the distance created as a result of the lack of reference to discriminating actions, contributes to the reduction of awareness of the gravity of the problem in the recipient of the content. It is important to identify the most common manifestations of discrimination occurring in the peer group. Behavior discriminating the victim in the literature is divided into verbal, non-verbal, mental and physical. The first symptom mentioned includes threatening, mocking, hooting – not to, but at a victim, most commonly in the aim of an offense, humiliation [3]. Making inappropriate, offending gestures towards a victim is allocated as a nonverbal behavior. Among mental forms of discrimination acts, the ignoring, terrorizing, vilipending and the exclusion from an informal group [4], making hostile faces, rejection to sit with a discriminated person, and forcing her or him to humiliating activities as walking on all their fours, along with imitating a dog [5]. Significantly more examples of this behavior are being mentioned in a physical discrimination framework. It lists beating, poking [4], physically harming, holding down [3], kicking, spitting on a victim, smacking, just as thieving, sexually harassing, dressing down, followingly talking pictures, rapes [5].

The manifestations of discriminatory practices are listed, including exclusion from the informal group. This concept is defined in the literature as peer exclusion or rejection. It is "the phenomenon of depriving people of the possibility of constructive satisfaction of psychosocial needs and developmental tasks" [6]. This mechanism consists in the rejection of one member of a given group by the others. It is associated with a negative attitude to this unit and the degree to which it is not liked [7].

Determinants of discrimination in a peer group

It is worth pointing out various factors that may condition the phenomenon of peer discrimination. The roles, character and level of relations, or the prevailing structure of a given environment, i.e. a social group, may be not without significance.

Peers are a form of social group, apparently distinguished not only because of the age similarity. The unique type of bonds between the members of the group is taken into account, as well as participation based on mutual approval [8]. This community is often defined as a primary group, which emphasizes the intimacy of the bonds between the members and emphasizes the sense of belonging to a specific whole [9]. Being an element of a bigger system is intrinsically linked to the existence of smaller or bigger divisions in terms of performed roles. Consistently they may remain nonconscious to some individuals. It results mainly from a correlation between a role and a social position [1]. The referenced roles may be treated as an independently existing, preclusive performing their prospective decision and even preconceived on the day of birth. Much more crucial for this issue is the essence of the roles obtained, which are based on the fact that "we acquire them through our own decisions and efforts" [1]. In a peer group we deal with a peer's role, usually depended on an individual, his or her willingness of an affiliation to a particular group and an approval of acts associated with that role, or submitting to a specified structure, dictated by a determined level of consciousness. Then the particular individual's determination to maintain a defined level of one's role, may contribute to discrimination actions towards other people, dominant individuals exclusively. There is no lack of a situation when in a play group, crowd, or grouping in a class [10], seemingly insignificant events occur, in fact pushing selected individuals

to the margin of the group, only because of the role of the person who subordinates the rest of their colleagues.

In the context of this issue, it is worth looking at the twelve examples of roles that can be performed in a group. They reflect certain personality traits and some of them show predispositions that carry the risk of discrimination. The roles listed in the collection include, respectively: the leader of domination (rebel or expert), the leader of sympathy (mediator), the clown scapegoat, the primus, the outsider (ignorer), the expression of group moods, the stabilizer of group emotions, the guardian of norms, the orphan, the crazy child, the critic [11]. The leader of dominance has a strong discriminatory tendency. Among his peers, he performs leadership functions, subordinating himself to the rest of the people and setting the goals and rules of the group, and even speaking. This gives grounds for easy influence on others and can lead to the social exclusion of individuals over time. Although it is indicated to avoid unpleasant feelings and to expose the manipulation of this role, the possibility of an unconscious action with a discriminatory character is most justified in this case. A crazy child is another role with specific components. Such a person has no resistance to expressing different desires or impulses and may be much more inclined than his colleagues to express emotions and sentences even those unfavorable to others, thus exposing them to discrimination and rejection. He also exposes himself by doing so, since this type of behavior is usually not cordial, sometimes provoking conflicts within the group. A role that can also be combined with the likelihood of discrimination is also played by the critic who questions the activity of the leader and thus induces critical thinking in the other members of this community [11]. It is not difficult to imagine what will happen when this kind of thinking is directed at the selected individual and touches him personally. It should be emphasized that apart from the indicated roles, there is a probability of a tendency to discriminate in the case of people with a combination of seemingly unrelated characteristics. There is no such thing as a universal profile of a discriminating person.

Functioning in roles within a peer group is not possible without a proper level of relationship. The inappropriate nature of this relationship may lead to the appearance of manifestations of peer discrimination. One of the most basic is the psychosocial functioning of individuals among themselves. It concerns individual personality traits and depends on a person's level of development and their experience. It manifests itself in everyday functioning with peers, among others in the ways of establishing relationships, performing common tasks, or in emotional resilience and coping with conflict situations. Some specific characteristics and inclinations may contribute more than others to unfair and inappropriate treatment of other people. An important factor determining relationships is the so-called group cohesion, which is expressed in the mutual kindness and cordiality of members. "It is the joint pursuit of a goal and shared responsibility for what happens in the group [12]. Cohesion has typical indicators informing about its real existence. These include the characteristic behavior of students, such as: polite attitude towards colleagues, standing up for them when necessary, joint planning and implementation of actions, and recognition of identical standards of behavior [13]. As it is a kind of pillar of group understanding, the disruption of this cohesiveness may result in the risk of peer rejection. The occurrence of clear deviations in these areas may have a negative impact on the peer group, as the higher the degree of consistency, the less likely there is to be discrimination.

In discussing the phenomenon of discrimination, the system of social control also requires attention. It refers strictly to social norms, which include valuing the importance of different behavior in terms of group interests, expectations of the required behavior and reactions to specific behaviors of members in the form of negative or positive sanctions, i.e. penalties and rewards. The punishment which is most harmful from the perspective of both children and youth is rejection by colleagues, i.e. a social punishment [14]. Individuals who do not comply with the established standards are undoubtedly at high risk of exclusion in their environment. Control in this form allows dominant people (with leadership qualities) to quickly identify a nonconformist who becomes a potential discriminator. In a different situation, however, compliance with the standards affects the position and prestige of the individual. Prestige may be related to the role played, the level occupied on a social scale or may be a result of an individual's perception of someone [15]. Regardless of the interpretation, the prestige is a determinant of a specific hierarchy occurring in the peer environment, which makes it possible to distinguish and indicate both discriminating and discriminated persons. A high level of prestige guarantees an individual a high position in the hierarchy of a social group and therefore, they are able to initiate discriminatory behaviors with a high probability. This results from the full recognition of such a person's opinion, trust, respect, approval, or willingness to imitate them [16]. This is particularly evident in the case of total uniformity of the group, when members present a unified way of thinking and perceiving reality and are willing to treat selected individuals in an improper manner [17]. On the other hand, persons of lower prestige should be assigned to a group exposed to discrimination.

In terms of sociometric status, the members of a peer group can be divided into several selected groups. The first is made up of popular people who are positively received by their peers and have many advantages, such as sociability, optimism, and willingness to cooperate. Often the suspicion of discriminating against others is completely removed from them, which may turn out to be wrong. Other groups are disregarded and rejected individuals, which together constitute an unpopular group. Those belonging to this category meet a certain degree of resentment from their peers, are ignored and usually disliked [18]. They do not occupy a more significant place in the group structure and may experience discrimination. A similar hierarchy is created by the division proposed by Dorota Ekiert-Grabowska [19]. It distinguishes accepted, average accepted, unbalanced and unacceptable individuals, who are isolated and rejected. In this classification, the discriminating status can be considered in relation to accepted or average accepted individuals. In turn, people with an unbalanced and unacceptable status may be confronted with discrimination. In terms of group position, the leadership structure should also be mentioned. It assumes that essential interests and group matters are controlled by one dominant entity, acting as a leader [20]. It is this entity that subordinates the others, and from it the problem of discrimination originates. This results from the formation of an informal hierarchy within the group. Its lowest levels are occupied by those members of the group who are most submissive to those who are at the higher levels [21]. This kind of hierarchy results in the following dependence: the lower the level in the hierarchy, the more likely it is to find itself as a victim in a potential discriminatory situation. The higher the level of the occupied position, the higher the probability of becoming a perpetrator.

The influence of members occupying the highest positions in the group's hierarchy is undoubtedly the most important in relation to discriminatory situations taking place in the group.

As the rest of the members usually follow this person, he or she has great power. Consequently, it is able to influence a given situation in the group. The behavior of an individual or a group of people who are at the highest level of the hierarchy determines the cessation of discrimination in a situation aimed at this, or, on the contrary, the stigmatization of a potential victim leading to a discriminatory situation, or to discriminatory actions spread over time.

The circumstances described above, in which group leaders play a decisive role in a situation potentially leading to the problem in question, may be due, *inter alia*, to the type of personality of the entity in that position. Theodor Adorno, referring to the specificity of a group leader's position, evokes an authoritarian personality as a type that is biased towards projection and stereotyping [22]. The situation in which a group leader is characterized by the above-mentioned characteristics is conducive to both initiating and sustaining or reproducing discriminatory behavior.

The desires or needs of the individual or the perpetrator are also favorable to the creation of the scapegoat. The scapegoat is a person who is not at fault. He/she is held responsible for not following the rules of the group, or "bears responsibility for the failures of another person or group" [23], and subsequently fails in group relationships and is subject to peer exclusion. The desire to control the group, typical of people with leading characters - and thus also often occupying top positions in the hierarchy - is sometimes satisfied by discrimination against another member of the group. Closely related to this aspect is also the desire for violence, which is to be marginalized or discriminated against by the victim. The need for self-cleaning, also known as the projection mechanism, also proves to be important. The torturer designs, thus transferring his own fears and anxieties to another person making him a victim. The features ascribed in the process of projection are usually socially denied, which stigmatizes the discriminated individual and leads to a negative attitude of the rest of the group towards this excluded person. Similarly, although usually more consciously, the need for the discriminator to self-justify himself or herself is influenced. When the discriminator is to blame for the failure or failure of the group as a whole, he or she blames the victim. In this way, the scapegoat takes on the punishment for the failure of the executioner, and the executioner is cleansed [23]. This situation can fall into two contexts: when the person passing the blame wants to justify himself in front of the rest of the group in order not to suffer the consequences of his own intentional or wrongful actions, but also when the whole group is responsible for the failure and, through cognitive dissonance, needs to pass the blame on to a particular physical person (one or more) in order to self-justify himself. Similar is the need for a response, which is based on discharging the negative emotion from the victim and thus punishing him for his own failures. The three needs mentioned above as last, and therefore the need for self-cleaning, self-justification, and self-responsiveness have a common, connecting factor, namely cathartic significance [23]. It is this which points to the selfish care of one's own position and well-being of the discriminating person, who in these situations has no significant external reason for discriminating against the victim.

The factors described in the text that cause discriminatory situations are not the only ones that contribute to the problem. The above-mentioned needs and personality traits are internal conditions of the perpetrators. External factors also have such a significant impact that they are a source of behavior that makes the person who manifests them discriminate. As it turns out, the lack of availability of an individual or subgroup that is to blame for the failure of the whole group is one of

the factors that raises the need to designate another entity responsible for the problem. In a crisis situation, the group, its leader, or the person who feels threatened with being blamed, takes action on behalf of the majority to prevent the spread of guilt and responsibility throughout the group, thus creating a scapegoat. Thus, it is supposed to reduce the number of victims to a minimum and eliminate the risk of the perpetrator entering the role of a victim [23].

When analyzing the genesis of discrimination in the context of people participating in it, conditions resulting from the specific personality of the individual acting as a victim are also important. There are four typical behaviors, which are to a large extent a condition for the rejection of the peer entity manifesting them. Individuals with relatively low social abilities and little involvement in social life are at risk of being rejected by their peers. The situation is similar when it comes to immature or aggressive or destructive behavior. Behavior that is primarily based on social anxiety is also important, as well as avoidance [24].

Conclusion

In the above article, we have presented the determinants of the origin of the problem of discrimination in the peer group. The reference to particular aspects influencing the origin of this problem is to create a kind of framework or schematic outline, thanks to which the teacher, educator or guardian of a given group will be able to look at their wards from the perspective of potential participants of the discriminatory situation. By fostering awareness among educators of the tendency to enter into particular roles, it is possible to reduce the risk of discrimination in particular peer groups, which at the same time can save potential victims from the permanent and damaging consequences of such experiences.

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STYLES OF RESPONDING IN A DIFFICULT SITUATION OF PROFESSIONAL SOLDIERS

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Abstract:

The article deals with the styles of reacting in the difficult situation of professional soldiers. So far, the styles of reacting in difficult situations in soldiers have not been studied. Knowledge of the styles of reacting in difficult situations of soldiers is important for commanders in managing a team. The aim of the research was to try to understand and define the styles of responding to difficult situations in professional soldiers. The exploratory goal was to identify the relationship between the styles of reacting in a difficult situation and selected individual-personality, social-environmental and professional conditions of professional soldiers. The practical goal was to indicate directives that could be applied in the field of psychoeducation of professional soldiers. The research method used in the study is a diagnostic survey. The research results indicate a statistical significance between the task-focused style and the democratic style of parenting in the family.

Keywords:

response styles in a difficult situation, soldier, stress

Introduction

Although stress has accompanied soldiers since the earliest times, the losses expressed in the injuries of the soldier's psyche were ignored and treated as a forbidden topic at the beginning of the 20th century. They have now become equivalent to losses in the fallen on the battlefield. For these issues, it is extremely important to know how the mechanisms that reduce stress work, because the predispositions to respond to stressors are individual [1], and so far no universal stress response scheme has been developed [2]. The ability to cope with existential and professional stress, demonstrating adaptability, is a fundamental factor conditioning human health [3]. Updating knowledge about stress and its negative consequences, referred to as the 21st century global epidemic, is a very important task and challenge for science [4]. In the face of reports from various fields, the increasing awareness of health threats should lead to an increase in interest in practical personal skills necessary for its protection, as the developing civilization diseases indicate the obligation to constantly improve competence in coping with stress, for example through

psychoeducational actions, which they allow psychological adaptation because the styles of response in difficult situations are subject to modification and are self-controllable. In order to meet the requirements of postmodern reality, modern homo adaptabilis is forced to find such coping methods that will guarantee it unlimited participation in every phase of life [3].

Stressful working conditions for soldiers

Stressful nature of the army's functioning

One of the most stressful professions is the profession of a soldier [5]. The nature of the army means that stress is compounded by various types of situations that cannot be eliminated, and has a very significant impact on the psychophysical condition and operational capabilities of individuals, and thus on the efficiency and effectiveness of professional activities. The soldier is often unaware of the impact of stressors during daily service [1], the more so that stress reactions may appear long after the stimulus has appeared. The problem of stress is also important for society, because highly stressful factors affect not only the quality of life of soldiers but also its surroundings. A common phenomenon among the military are personal life tragedies related to alcohol and drug abuse, social and family alienation, the inability to find civil life after retirement, finding a job, and in marriage relationships lead to divorce [5] or end in suicide [6].

Family style

Coping strategies in difficult situations have been evolving since early childhood as a result of the individual's interaction with the environment. Tested in various situations and evaluated for effectiveness, they create key beliefs about the ability to control the experience of stress, which determines the tendencies in choosing a strategy [7]. Democratic style of upbringing indicates positive upbringing impact, is the basis for proper development, determines developmental functionality (lack of pathology) in the context of basic needs that are revealed in the period of adolescence (independence, love, support) and support overcoming the identity crisis. The family atmosphere is conducive to shaping social and cognitive competences supporting individual self-creation: self-esteem, self-confidence, social responsibility, cooperation skills, self-control, high achievement motivation, sense of happiness - optimism, cognitive activity, and finally task-based coping strategies [8].

Professional degree

It is characteristic for military systems that valued values (honor, bravery, courage) allow some soldiers to deal with military stress more effectively. Incorrect attitudes, lack of commitment and identification with the service, and non-identification with the above-mentioned values may determine the use of incorrect styles of response in a difficult situation. This factor may be the reason why private soldiers remain at the lowest stage of their military career [9]. The corps of privates is at the base of the military hierarchy, hence the orders are always imposed from above. People who do not identify with the objectives and forms of functioning of the army fall into conflicts, which is caused by the restriction of freedom of action, which triggers psychological stress in accordance with the model: requirements - control - support. Discipline means that control over one's own actions is limited to the extent determined by laws, regulations, codes, orders and

instructions. The reason for this state of affairs can also be seen in the lack of satisfaction with the course of his professional career, the sense of an inappropriate organizational structure of the army, which does not allow promotion and pathology of the Polish Armed Forces [10].

Participation in the mission

Undoubtedly, in military realities, the largest accumulation of stressors takes place during a military mission. The consequences of participating in a war zone are not only negative (post-traumatic stress disorder), but also positive [11]. The phenomenon of post-traumatic growth is a consequence of attempting to deal with a traumatic event. It is based on appreciating life through an in-depth experience of understanding the world, changing self perception and relationships. This allows one to deal with subsequent crises more effectively. Occurring growth changes are the result of engaging cognitive processes of trauma processing, reconstruction of changed or destroyed cognitive patterns, searching for meaning, and significance for further life. Posttraumatic growth is not just a return to balance after a traumatic experience. This phenomenon indicates that the entity is undergoing transformation and acquires a higher level of functioning [11]. Many soldiers treat the participation in the mission as a kind of initiation, the opportunity to test their professional skills in the face of warfare, as well as the fulfillment of male instincts [11]. Soldiers participating in military missions who return to the war zones several times, where they experience traumatic events many times, are exposed to changes in the direction of an adverse, emotional style of reacting in a difficult situation. The reasons for these trends are mainly in the low quality and functionality of psychological care. We should also mention the stereotypes that on the one hand relate to the stigmatization of people using psychological or psychiatric care, and on the other the silhouette of a soldier - a model of bravery, strength, heroism and triumph based on courage, hardening, physical fitness and full fitness. There is no place for fear or doubt. The self-esteem of a "hard man" is defined by zero one message: I am brave or weak, I am a hero or a coward [6].

Human reactions to stress

The state of stress is a set of physiological reactions - changes that can be registered (at the physiological level) or observed when the stressor ("load size") exceeds a certain stress threshold (intensity threshold) characteristic of a particular person at a given moment. Stress response has its own characteristics that can be defined in two areas and three levels.

From the point of view of increasing the intensity of stress, the separated areas are:

- the area of regulation system overload - maladaptation reactions, focusing not on the task but on defense against the effects of stress;
- the load area of the regulation system - these are reactions that fit into the adaptive system, although modified by the presence of stress.

There are two ways of coping with the stress/ responding to stress [12]:

The path of non-specific changes - is associated with emotional reactions accompanying stress.

Crossing the threshold of stress begins the first phase of mobilization, during which an efficient compensation mechanism reacts adaptive to stress by: improving intellectual performance and motor skills, accelerating the pace of action, increasing energy and behavioral activity [12].

The second phase (the upset phase) is associated with an increase in stress. It performs the function of signaling the transition from adaptive mode to a stress-disadaptation system. The signal of this transition is the activation of overcompensation mechanisms characterized by an increase in emotional tension and deterioration of psychomotor processes (visual-motor coordination disorders, impaired sensitivity to stimuli), orientation (worsening problem solving, memory gaps, narrowing attention) [12].

The third phase (destruction phase) is associated with a further increase in stress, exhaustion of the body and disorganization of action. Destructive reactions (specific for this phase) are manifested in the disorganization of processes:

- indicative - repetition of irrational solutions, reduction of perceptive abilities)
- psychomotor - no reaction to stimuli, uncoordinated movements).

Emotional tension reaches a very high level, which results in a decrease in interest (apathy, lack of motivation for action).

2) Specific change path - consists of two forms of reactions depending on the "stress tolerance threshold" [12]:

- Stress control reactions (accompany the mobilization phase) - they are adapted to the type of stress factor whose elimination is the main goal. These activities include: eliminating the source of stress (obstacles); renewing the effort to fight stress; changing the way one act; passive attitude towards the situation (ignoring the threat); examining the situation (permanent stress control - so-called art for the sake of art).
- Defensive stress responses - occur as a result of exceeding the stress tolerance threshold, where stress-fighting responses take the form of ineffective ones. The "stress tolerance threshold" is not considered as a scale point but an area within which specific stress control responses and defense responses against stress coexist. The last ones take the form of: real (withdrawal from stressful situations, avoidance or attacking an obstacle) or relatively symbolic (denial, fantasizing).

3) Changes in expressive activities - are associated with 'discharge behaviors'. Their essence lies in the fact that they do not serve to achieve specific external goals but signal a state of emotional tension caused by stress. Emotional reactions are divided into: controlled, partially controlled and uncontrolled.

Expressive activities related to controlled emotional reactions relate to expressing dissatisfaction and disapproval in a socially acceptable way which is to verbalize painful experiences.

Partially controlled emotional reactions rely on the discharge of fear, helplessness and anger in an unacceptable social form. Further increase in stress leads to uncontrolled emotional reactions, which are characterized by high violence (panic, rage, despair) and completely disorganize human activity or result in its abandonment [12].

Reaction styles in a difficult situation

Coping with stress is understood as the ability to maintain dynamic balance or reduce discrepancies between the capabilities of an individual and internal and external requirements that he perceives as burdensome or in excess of his resources. Through cognitive processes, the individual registers threats and realizes the study of adaptive research, and the accompanying emotional experiences realize that the body is stimulated in order to improve the stressful situation. It is this activity adequate to the stressful situation, a specific disposition (feature) of the mode of action and coping with stress, which is a peculiar style for an individual. For N. S. Endler and J. D. Parkera coping style is a repetitive, right way for a person to deal with difficult situations [4].

Effective struggle with difficulties using individually defined methods strengthens the sense of effectiveness. Thus, the styles of reacting in a difficult situation are more important for shaping one's own effectiveness than the other way round. People with a strong belief in the effectiveness of their actions and task-oriented style of coping with stress will cope best in occupations with a high stress index [13].

Task focused style

Units with high scores on a task-focused style scale make an effort to solve a problem. They actively undertake tasks by cognitive transformation of the situation or attempts to change it thanks to better time planning, prioritization, recalling previous solutions, setting the course of action and the ability to perceive difficulties from different points of view. In the case of these people, the emphasis is on analyzing the options for getting out of the situation and assessing profits and losses [3]. This style is most adequate to the specificity of the soldier's silhouette, because this profession with a narrow specialization has well-established educational principles adapted to the requirements of the battlefield. As a guardian of state security, a soldier should be distinguished by leadership qualities, make rational and accurate decisions, and above all, take and carry out orders [14].

Emotional style

People with an emotion-focused style tend to focus on their own emotional experiences and feelings. These individuals have a tendency to fantasize and wishful thinking, which is aimed at reducing the stress associated with a stressful situation, but in this way they increase nervousness, with the consequence of increasing depression [3]. Emotional disorders of soldiers are considered the most serious source of problems in adapting to the conditions of military life, because in adverse conditions they effectively hinder functioning. Adaptation disorders have emotional grounds, because relying on overly aroused and uncontrolled emotions causes many problems. The army is an institution that places special demands on the emotional sphere of soldiers. It can be said after A. Hochschild that the profession of a soldier requires putting special effort to control his emotions [15].

A unique style

Avoidance-focused style is typical of people who avoid experiencing, experiencing and thinking about stressful situations. This style is divided into two subtypes: engaging in substitute activities and seeking social contacts. The first of them is characterized by a tendency to watch TV, binge, and make unnecessary purchases. People with a second subtype in difficult situations call a friend,

visit friends or relatives, feel the need to be in a group [3]. A unique feature of the avoidant style is also the fear that appears in a difficult situation about the future of one's own and the family, and therefore a lower risk propensity. What's more, hard, restrictive rules are not fully accepted and people with a avoidant style assume that rules that are not followed should be changed. This approach creates a conflict in the clash with the reality of the army, where discipline, norms and rules form the basis of functioning.

Research methodology

Purpose of research

The subject of the research are the styles of reacting to the difficult situation of professional soldiers in connection with selected determinants. Is there a relationship between the style of reaction in the difficult situation of professional soldiers and selected determinants? There is a relationship between the style of reaction in the difficult situation of professional soldiers and the selected determinants. The cognitive goal of the research was an attempt to learn and define styles of response in a difficult situation in professional soldiers. The exploration goal was to show the relationship between styles of response in a difficult situation and the socio-environmental and professional conditions of professional soldiers. The practical goal was to indicate directives that could be applied in the field of psychoeducation of professional soldiers.

Research methods and research tools

The research material was collected by means of a diagnostic survey using the Coping Questionnaire in Stress Situations (CISS) Normana Endler and James Parkes. They carried out the Polish adaptation of CISS P. Szczepaniak, K. Wrześniewski and J. Strelau (1994). This tool can be used to examine people over 18 years of age.

The questionnaire consists of 48 statements describing behavior in difficult situations. Next to each statement is a 5-point scale. Respondents mark the frequency of actions taken in difficult situations. 16 statements were assigned to each of the three styles of coping with stress.

The tool allows you to obtain three indicators of coping with stress: task style (CISS-Z), emotional style (CISS-E), avoidance style (CISS-U): surrogate activities (CISS-U-CZ) and seeking company (CISS-U-PT). Each of them can have a value from 16 to 80 points. The indicators are not aggregated. The higher the indicator value, the greater the severity of the given style of coping with stress. The avoidance style indicator contains two sub-indicators: substitute activities (from 8 to 40 points) and seeking company (from 5 to 25 points) [16].

The analysis of relationships between the independent variable and the dependent variable was conducted according to three groups corresponding to the following conditions: 1) socio-environmental, 2) professional.

Statistical analyzes were performed using IBM SPSS STATISTIC computer software (version 24.). An analysis of variance using the ANOVA test was used to check the obtained test results and determine their significance and the relationship between the style of responding in a difficult situation and selected conditions. In accordance with the methodology adopted in social sciences, the threshold of significance of formal analyzes was assumed to be less than or equal to 0.05 in this paper.

Characteristics of the tested sample

Making a targeted selection and selection based on volunteer applications due to the specifics of the study group, a sample of 157 people was selected. The group of respondents included 91% men and 9% women. These proportions accurately reflect the current gender structure in the population of the Polish army.

The respondents were divided into four age groups: 18-25 years (38 people - 24.2%), 26-35 years (69 people - 43.9%), 36-50 years (46 people - 29.3%) and \geq 51 years (4 people - 2.5%). Most respondents, almost half, were in the age range 26 to 35 years old.

Over half of the respondents are people brought up in the democratic style (52.9%). A fairly large group of people are also soldiers brought up in an autocratic style (24.2%). 15.3% of soldiers characterized liberal upbringing. A small percentage of people concerned those born in the erratic way (7.6%). In the further part of the characteristics, reference is made to the professional level of the respondents. The vast majority of respondents served in the serial corps (82.8%). 3.8% of the soldiers belonged to the non-commissioned corps, while 13.4% of the respondents belonged to the officer corps. In the group of soldiers surveyed, the majority did not participate in the military mission (87.9%), a small part experienced the realities of the foreign mission (7%), even more often (5.1%).

Findings

Analysis of the results shows that the dominant style of responding in a difficult situation to soldiers is the style focused on the task (87.9%).

Tab. 1. Distribution of the number of response styles in difficult situations of soldiers

Reaction styles in a difficult situation	Percent
Task style	87.9%
Emotional style	3.8%
A unique style	8.3%
Altogether	100.0%

Source: Own research

Based on the obtained research results, statistical significance was found between the task-focused style ($p = 0.05$) and the style of parenting in the family of the respondents. The distribution of the average ($M = 59.53$; $SD = 7.59$) indicates that this style is representative for respondents who have a democratic style of parenting.

Tab. 2. Strategies for dealing with difficult situations used by soldiers, taking into account the style of parenting

Family style	Questionnaire scales CISS		F	The significance
	Task-focused style			
	M	SD		
Liberal style	56.21	6.5	2.72	0.05
Democratic style	59.53	7.59		
Autocratic style	56.13	8.44		
Erratic style	55.67	6.3		

Style focused on emotions				
Liberal style	38.08	8.37	0.53	0.66
Styl demokratyczny	35.41	9.10		
Autocratic style	35.89	11.97		
Erratic style	37.42	10.49		
Avoidance focused style				
Liberal style	44.29	10.25	1.03	0.38
Democratic style	44.69	8.81		
Autocratic style	42.00	9.67		
Erratic style	46.75	12.45		

Source: Own research

The distribution of the average indicates that the emotion-focused style ($M = 36.66$; $SD = 9.98$), the avoidant style ($M = 44.98$; $SD = 9.04$) and the search for company ($M = 17.55$; $SD = 3.53$) are characteristic styles of responding in a difficult situation for respondents belonging to serial corps.

Tab. 4. Strategies of dealing with difficult situations used by soldiers, taking into account belonging to the military corps

Belonging to the corps	Questionnaire scales CISS		F	The significance
	Task-focused style			
	M	SD		
Serial Corps	57.72	7.65	0.44	0.65
Officer corps	58.24	7.26		
NCO's corps	60.67	10.67		
Style focused on emotions				
Serial Corps	36.66	9.98	3.54	0.03
Officer corps	35.43	8.16		
NCO's corps	26.00	6.69		
Avoidance focused style				
Serial Corps	44.98	9.04	3.34	0.04
Officer corps	40.71	10.66		
NCO's corps	37.67	12.79		
Replacement activities				
Serial Corps	20.27	6.00	1.73	0.18
Officer corps	18.24	6.43		
NCO's corps	17.00	5.59		
Search for company				
Serial Corps	17.55	3.53	2.98	0.05
Officer corps	15.76	3.62		
NCO's corps	15.33	6.47		

Source: Own research

Ways of coping with a difficult situation are related to the degree of social competence. People with high social competences receive more support from other people in a difficult situation, thus they reduce stress better and are able to deal with it more effectively. Therefore, one can expect

positive correlations between social competences and the task-oriented style of reacting in a difficult and negative correlation with the avoidance and emotional style of reacting [17].

The reason for this state of affairs - it seems - can also be seen in the dissatisfaction with the course of the professional career, the feeling of an inappropriate organizational structure of the army, which does not allow for promotion, and, as indicated by M. Niemiec [10] and J. Tylka [18] pathological climate and culture of the organization, low level of participation in decision making, high rigor of discipline in relation to civil professions.

The privates' corps is at the base of the military hierarchy, hence the orders are always imposed from above. Some people do not identify with the goals and forms of functioning, others fall into conflicts, and a closed group of people at this level has a much smaller opportunity to react to negative emotions. The relationship between the functioning of the supervisor and the subordinate may result in activities not fully accepted by the individual and, as a result, resulting in work stress. Due to the fact that the rank and file experiences only a directive style of management, the relationship with the supervisor is the most important for job satisfaction in an organizational climate, and work stress (dissatisfaction with work and management style) has the greatest impact on resignation from the service. Limiting the freedom of action triggers psychological stress in accordance with the model: requirements - control - support. Discipline causes that the control of one's own actions is limited to the extent specified by laws, regulations, codes, orders and orders. If the lowest-level soldier does not fully understand the importance of the proper soldier attitude, it may be violated.

Characteristic for military systems is that cherished values (honor, bravery, courage) allow some soldiers to more effectively deal with military stress. Therefore, inappropriate attitudes, which are the most common among rank and file soldiers, such as commitment and identification with the service and non-identification with the above-mentioned values, may determine the use of incorrect styles of reacting in a difficult situation: emotional, avoidance and seeking companionship. This factor may be the reason why privates remain at the lowest stage of their military career [6].

Taking into account the conducted statistical analysis, it can be concluded that there is a relationship between the style of reacting in a difficult situation and the professional rank of the respondents. This relationship was observed between the style focused on emotions and the style focused on avoidance; looking for companionship.

Statistical significance was found between the task style ($p = 0.02$) and the emotional style ($p = 0.00$) and participation in the mission of the respondents. The distribution of the average indicates that the task style ($M = 62.55$; $SD = 7.47$) is characteristic for soldiers who participated in only one mission, while the emotional style ($M = 36.89$; $SD = 9.87$) is representative for soldiers who have never participated in a mission.

Tab. 5. Strategies for dealing with difficult situations used by soldiers, including participation in the mission

Participation in a foreign mission	Questionnaire scales CISS		F	The significance
	Task-focused style			
	M	SD		
No participation	57.83	7.44	3.86	0.02
Participation in one mission	62.55	7.47		
Participation in many missions	52.88	9.57		
Style focused on emotions				
No participation	36.89	9.87	6.16	0.00
Participation in one mission	34.09	5.41		
Participation in many missions	25.00	6.72		
Avoidance focused style				
No participation	44.32	9.2	2.48	0.09
Participation in one mission	46.73	9.90		
Participation in many missions	37.38	13.19		

Source: Own research

Summary

There is a need for further research on stress in soldiers.

There is a relationship between the style of reaction in the difficult situation of professional soldiers and the selected determinants. Analysis of the results showed that the dominant style of responding in a difficult situation in professional soldiers is the task-focused style (87.9%). A unique style of responding to the situation occurs in 8.3% of respondents. The least people were characterized by an emotional response style (3.8%). The analysis of the research showed that there is a relationship between the task-focused style and the democratic style of parenting and participation in only one mission. There is also a relationship between a style focused on emotions, a style of avoiding and seeking company, and belonging to a private corps.

The research results indicate a necessity:

1) The postulate to conduct reliable education and workshop classes for soldiers and their families in the area of stress and related issues. Thanks to knowledge in this area, it is possible to shape skills: a) registering stressors and stress symptoms, which creates the opportunity to fight them and prevent the achievement of chronic stress states; b) assessing its capabilities and resources in the fight against stress; c) active stress management. This involves attempting to eliminate stress factors, solving difficult problems, firmness in the fight against stress and desensitization (i.e. eliminating hypersensitivity, such as phobias). The ability to tolerate stress is an indispensable approach when other strategies fail. This is related to cognitive restructuring involving the reduction of perception of threat by perceiving the correct ratio between positive results and failures. Tolerance of stress is a kind of escape from reality through defense mechanisms of repression or denial of reality. Another strategy in the field of stress tolerance is to shift attention from an emotional response to a stress factor. This creates a distance between the stressor and the person, which increases the objectification of the assessment of the actual threat, and also facilitates the use of own resources [12].

2) Research shows that a one-off participation in a military mission determines the task-oriented style of responding in a difficult situation, so it is justified to enable and encourage soldiers to gain this type of experience. At the same time, multiple participation in hostilities should be limited to prevent soldiers from developing a tendency to respond in an emotional way.

3) The results of the research clearly show that soldiers belonging to the rank and file corps use the least desirable styles in military formation. Paving the way for rapid promotion in army structures will increase qualifications and desirable competences.

The vast majority of research deals with the issue of stress in the army only in relation to the experience of traumatic stress of soldiers on missions outside the country. Undoubtedly, we cannot limit ourselves to this dimension. One should not forget about the burdens of daily professional military service [18].

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BREEDING OF THE GROUND BUMBLEBEE - *BOMBUS TERRESTRIS* (L., 1758) IN POLAND

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Abstract:

Wild bumblebee populations around the world are dying at a rapid pace. In comparison with bees, whose role in pollination of plants is widely known, references to bumblebees appear rather occasionally. Breeding bumblebees is one of the methods of their protection, thanks to which it becomes possible not only to use these hymenoptera to pollinate crops grown by man, but also to supply local populations with healthy and strong bumblebee families. In Poland, mainly bumblebee *Bombus terrestris* is bred, sometimes bumblebee *Bombus lapidarius*), which is only a small part among domestic species. Unfortunately, instead of encouraging breeders to choose Polish bumblebees as breeding species, families from the Mediterranean basin that are not adapted to life in our climate are brought in, which cross with native populations, weakening genetic material.

Keywords:

Bombus terrestris, bumblebee breeding, protects of Apidae

Introduction

The world's wild bumblebee populations are rapidly extinction. The reasons for reducing the number of these bees are seen in the intensification of agriculture, climate change and urbanisation. Compared with bees, whose role in pollinating plants is widely known, the mention of bumblebees still appear too rarely, and after all, bumblebees in our climatic zone pollinate about. 400 plant species important for agriculture and horticulture.

From Poland, 31 species of bumblebees are described, out of about 300 species known in the world, spread across all but Antarctica continents [1]. Inventory studies confirmed the presence of 28 native species, as the giant bumblebee (*Bombus fragrans*), Sichel (*B. sicheli*) and western (*B. cullumanus*) in the last few decades were not found in the country and according to the category of danger they were given exp status (probably extinct, or Ex. extinct). One species, *B. laesus*, was considered exapitable (E), 16 species were exposed (V) or rare (R) and two were given status I (of unspecified hazard). Thus, the list of species from which bumblebees could be selected for closed breeding was limited.

For the breeding of pollinators, 3 species of Polish bumblebees were selected - wood bumblebee (*B. hypnorum*), common carder bumblebee (*B. pascuorum*) and ground bumblebee (*B. terrestris*).

Observations were made in greenhouses with tomato cultivation (branch of ISK beekeeping in Puławy) as early as the mid-1970s. Of these bumblebee species, the most intensively flowed flowers of the wood bumblebee, but also caused their damage. The most effective pollinators of tomato flowers were the workers of the ground bumblebee and this species was selected for artificial breeding [2].

Subspecies of ground bumblebee *Bombus terrestris*

One of the most common bumblebee species in Western Palearctic is the *Bombus terrestris* (L., 1758) found in different geographical areas in 9 subspecies [3, 4]. To date, 9 distinguished subspecies have been discovered and described *Bombus terrestris* [5-8].

These include:

1. *ssp. terrestris* (L., 1758), settling northern Europe above 45 parallel;
2. *ssp. audax* (Harris 1780) found in the British Isles;
3. *ssp. calabricus* Krüger 1958, a subspecies from Italy (including Sicily),
4. *ssp. lusitanicus* Krüger 1956, living in southwestern France, Iberian Peninsula, Balearic Islands, Madeira;
5. *ssp. sassaricus* Tournier 1890, found in Sardinia;
6. *ssp. xanthopus* Kriechbaumer 1870, known for the islands of Corsica, Capraia, Elba
7. *ssp. canariensis* Pérez 1895, the only bumblebee found in the Canary Islands (Gran Canaria, Tenerife, La Palma, La Gomera, El Hierro);
8. *ssp. dalmatinus* Dalla Torre 1882, populating south-eastern France, northern Italy and the Balkan Peninsula and neighbouring regions;
9. *ssp. africanus* (Krüger 1956), originally from North Africa.

The earth bumblebee was brought as a pollinator, for example, to New Zealand [9], Tasmania [10], to Chile [11] or Japan [12]. Unfortunately, occupying new areas (e.g. Argentina) the earth bumblebee behaves like an invasive, expansive species competing with native pollinators [13].

Biology of the bumblebee *Bombus terrestris*

The earth bumblebee of the subspecies *ssp. terrestris* settles northern Europe, avoiding high mountains and preferring open areas. As social insects, bumblebees create nests, but they build them only periodically. The development cycle of this bumblebee is very well understood [14]. In natural conditions, young, fertilized queens of bumblebee appear in April (sooner or later depending on the temperature). Mothers put nests in the ground, often in abandoned burrows of rodents. After choosing a place to attach the nest, the female builds the main chamber to which a narrow entrance leads. Initially, the nest consists of two parts - for one mother lays several eggs, which heats her own body, in the other accumulates supplies for larvae [15]. Under conditions of sufficient food, the mother adds to the egg cell with the next, attaching them to the other. After

3 days, the larvae hatch and the mother connects the individual cells, so that one cradle is formed containing the whole brood, which also houses the mother, which continues to heat the larvae. To reach the 4th stage of the larvae live together, then the queen separates them into individual cells, provided with holes through which their feeding is carried out. Pupation is carried out in cocoons spun by larvae. Workers bite after about 12-13 days and the entire development cycle from the moment of laying eggs by the mother to the appearance of imaginary forms lasts 21 days. Young workers gain food and help their mother build more cells, where the queen lays eggs. At the turn of July and August, when the family counts from a few dozen to a hundred (or 200) individuals, sexual forms appear - young mothers and haploid males, formed by parthenogenesis, from unfertilized eggs folded by workers - thrust. After a few days, the drones leave the nest and fly around the area. Young mothers also fly out, who also no longer return to the nest, and after copulation look for places for wintering.

***Bombus terrestris* breeding in Poland**

Year-round breeding of bumblebees began in Belgium and the Netherlands in 1988, from locally harvested populations of the nominative subspecies *Bombus terrestris terrestris*.. These countries and Israel are at the forefront of the breeding and export of bumblebees used to pollinate greenhouse plants.

In Poland, the aforementioned ISK Beekeeping Branch in Puławy in the 1970s developed a method of seasonal bumblebee rearing, and in 1993-97 research was carried out on the method of year-round rearing [16].

Seasonal breeding (extensive) bumblebees are based on their natural reproductive cycle. It is carried out in mesh insulators, placed on the toppings of flowering plants (most often light white. In the insulators, a properly prepared wooden ulik (padded with dry grass) is placed and let in a female of any species of bumblebee caught from the environment. If after a while there are workers in isolators, it means that the female has established a nest and a new generation is the beginning of a growing family. Such a settled ulik can then be moved near the plants that the insects are supposed to pollinate [16].

Year-round (intensive) farming concerns bumblebees whose families are sold to fruit growers and gardeners for use in crops, including under foil (e.g. tomato, peppers, auberge, melon). This method of rearing is carried out in rooms where the specific microclimate (temperature and humidity) is maintained, allowing bumblebee families to be obtained regardless of the season. Mothers are selected to initiate a new bumblebee family after a period of several months of wintering (staying in rooms with reduced temperatures). Mothers are placed in small cardboard boxes, where they are fed, and after the nest is put on and the first workers (about 8-12 individuals) the family is resettled into larger boxes and continues to maintain until the right number of young workers is reached. Some families are sold and some are destined for further breeding.

In Poland, the family business, which is engaged in the breeding of earth bumblebees, from the mothers of the bumblebee selected in Puławy, has been thriving since 2003 and located under Kalisz Specialized Breeding Farm "Polski Trzmiel", which produces every year about 400000 bumblebees (5 000 families). Due to the quality of the material offered for sale, the owners do not

complain about the lack of buyers, and the proprietary name "Polski Trzmiel" has become synonymous with a good brand.

Bumblebees are harvested all year round - in summer they hatch in a summer insulator and in winter in a heated room. In the mating insulator there are mating flights, during which the females are fertilized by bumblebee drones. Of the mothers, only 20% are able to start a family. The mothers are buried in the ground, from where after about 2 weeks they are brought to further breeding and put into hibernation. After a period of cooling, mothers can be brought out of diapausis and assigned to start new families.

A family of bumblebees of about 10 000 people, 60-80 workers together with their mother, or so-called average, it is recommended by the owners of "Polish Trzmiel" to fly about 1.5 thousand m², and a large family (120-150 workers with a mother) is able to work up to 2.5 thousand m², with the guaranteed working life of the family (a persistent number of working workers) is 4-6 weeks. After this time, the number of the family decreases gradually until the death of the last individual, which lasts an additional 4-6 weeks. Some families are also accompanied by drones, especially when the family is intended for use in orchards.

The company "Polski Trzmiel" also breeds red-tailed bumblebees *Bombus lapidarius*, but for now on a smaller scale than the bumblebee, preparing for the commercial breeding of this species and placing it on the market in greater numbers.

According to Biliński [16] and Teper and Borański [17] very grateful for breeding bumblebee species, suitable for seasonal breeding (on the poles) is a common carder bumblebee (*Bombus pascuorum*). This species has a mild disposition, does not attack man, forms not very numerous families (30-50 individuals). Caught by nature and released into the isolators, mothers quickly put on nests. The workers of the ore bumblebee range in size from small figures, which are constantly in the hive to larger forms bringing nectar and pollen, flying flowers. This species can therefore be an alternative to commercial breeding of bumblebees.

Import of *Bombus terrestris*

As bumblebees for commercial pollination of plants are exported to countries beyond the natural range of their occurrence, subspecies are mixed with native populations of bumblebees. Families from the Mediterranean subspecies ssp. *dalmatinus* introduced to Poland show a different development cycle than ssp. *terrestris*.

Bumblebees originating in warmer regions do not normally enter a state of diapausis and are active throughout the year except for summer estimation (18). However, cases of wintering of the subspecies of the *dalmatinus* subspecies in the Alpine regions of Turkey have been documented [19]. Probably, then, over time, the families of this subspecies will begin to produce queens that can enter a state of diapausis, which, however, is a danger leading to a decrease in the number of the subspecies nominated due to its displacement by the subspecies ssp. *dalmatinus*. For now, however, the subspecies ssp. *dalmatinus* seems phenologically unsuitable for the survival of winter, as low temperatures are a barrier for it to prevent nesting [20]. The import of bumblebees to Poland takes place on a large scale - from the Netherlands alone from one company Koppert arrives in the country as many as 10.5 thousand families per year, which is twice as much as is able to produce

"Polski Trzmiel". On the Polish market there are also companies such as Biobest, SyngentaBioLine, Agroconsut, with the prices of bumblebee families comparable to Polish prices.

A similar situation occurs in England, where the native bumblebee *Bombus terrestris audax* competes with the 10,000 families a year brought to the country. *dalmatinus* [18]. In the United Kingdom, a very interesting phenomenon was observed, because in the warmer regions in the southern part of the island there were colonies of the subspecies *adax* showing activity also during the mild winter [21].

Bumblebees originating in the Mediterranean, imported into areas of northern Europe usually belonging to the subspecies, ssp. *dalmatinus* are not suitable for wintering in our conditions - they have a less dense hair cover and less spare material accumulated in the so-called fat corpuscle. The size of the fat body depends on the survival of bumblebees during hibernation, because in addition to the supply of nutrients, the fat body reduces the freezing temperature of the bumblebee body in winter conditions and ensures the isolation of internal organs.

Unfortunately, bumblebees of the the *dalmatinus* subspecies intersect with native individuals of the subspecies ssp. *terrestris*, causing intermediate characteristics to appear in the offspring, thereby reducing the genetic quality of local populations [22]. In addition, with the import of bumblebees, their parasites are also imported, which spread to native populations. Sometimes the quality and viability of imported families is poor, as they are offered as full-fledged families of so-called sprinklers - nests where workers and cocoons come from different, usually dying, mothers-free families.

In view of the above, the protection of the national genetic material of bumblebees has become an extremely important issue by promoting the breeding of the native subspecies *Bombus terrestris terrestris*.

The importance of bumblebees

At a time when wild bee populations are being lost, breeding of terrestrial bumblebees in Poland is a significant strengthening of families living in the wild. Every year, greenhouses with pollinated plants leave many breeding bumblebees. Compared to honeybee, bumblebees work more efficiently - they visit within a minute from 20 to 25 flowers, fly at a lower temperature (in summer at 11⁰ C, and bees at 15⁰ C) starting from the morning hours, flying even after dark. Bumblebees can fly even in adverse weather conditions - drizzle or fog [16]. Where bees cannot be used because they break against the walls of the greenhouse, bumblebees can work even when there is more humidity and temperature under cover. Thanks to the fact that these stings did not develop a communication system in the likeness of bee dance, they do not communicate to each other information about the source of food found outside the greenhouse. The flight range of bumblebees is not far away, it reaches about 500-1000m from the nesting location, which is why it is easier to keep them indoors.

Bumblebee workers are larger than honeybees, so they carry more pollen on their body. The efficiency of one bumblebee specimen therefore corresponds to 4-5 bee workers [23].

Pollination of flowers by bumblebees is called vibrating - the bumblebee visits the flower and thanks to the movements of the body along with the wings introduces it into vibrations causing

pollen to be dumped from the anthers. In Poland, the ground bumblebee pollinated about 10 000 m. 400 plant species, with Ruszkowski [24] even reporting the number of 570 species, but it is thought to have also taken into account similar bumblebee species (such as *B. lucorum*, *B. magnus*, *B. cryptarum*).

Some of the plant species, even the so-called bumblebees, i.e. long flower tubes (such as light, field stamen, common eagle, clover, nasturtius) may also be pollinated by insect species other than bumblebees, but the flowers of the garden highland or the strong toad due to their strong closure can pollinate only bumblebees [14]. In bumblebees, the tongue that is part of the mouth apparatus is much longer (up to 25mm in the garden bumblebee) than in the bees, which predisposes them to reach deep into the bottom of such flowers, which bees are not able to pollinate.

The earth bumblebee contributes to the growth of the yields of many cultivated plants, working intensively especially in orchards and under cover. Dusty shrubs and fruit trees produce more fruit, while pollination of tomato flowers in greenhouses reaches 100%. In addition, the vegetables and fruits thus obtained are of better quality - more meaty, with a large number of seeds, with better taste qualities and nicer shapes. Bumblebees in greenhouses with tomatoes limit the development of grey mold, causing the rapidly falling of the encirclement, which does not mold and does not infect the fruit [2, 16].

The use of breeding bumblebees as pollinators of cultivated plants can be converted into a specific economic gain resulting from lower inputs and higher yields of better quality.

Summary

Bumblebee farming in Poland based on native subspecies contributes to the protection of these pollinators. The refugees from the kennel feed the local populations, so the quality and the corresponding subspecies of families for sale is so important. At the municipal level, information campaigns are needed to educate the public about the role of bees in urban and forest ecosystems. Sowing special bumblebees, allowing nests to be created on plots and backyard gardens, reducing the amount of pesticides used, sustainable agricultural production, as well as artificial breeding in the country, contribute to the conservation and increase in the number of bumblebees.

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COGNITIVE HEALTH DURING AGEING, PREVENTION OF DEMENTIA AND ALZHEIMER'S DISEASE

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Abstract:

Age-related progressive cognitive impairment affects millions of people worldwide and numbers are predicted to increase as populations are ageing. By the year 2050, it is estimated that 131 million of people aged 60 years or over, will be affected by dementia [1]. The most prevalent cause of dementia is Alzheimer's disease (AD) and it is recognized by the World Health Organization as a global public health priority. Aging is a process characterized by a decrease in efficiency of physiological functions. Memory impairment correspond with measures of oxidative stress and cholesterol in brain cells. Research shows that nutrition can modulate the immune system and may influence cognitive ageing via multiple neuroinflammatory pathways. The evidence supporting the role of proper dietary patterns, physical and cognitive exercise to preserve memory function during ageing, will be the focus of this article.

Keywords:

dementia, cognitive function, Alzheimer's disease, prevention

Introduction

Dementia is a progressive cognitive impairment in which deterioration in memory, thinking, orientation and behavior can be observed. It may also effect linguistic skills and emotional control. Dementia is caused by nerve cells damage, which leads to the brain tissue loss (neurodegeneration). Dementia impacts ability to perform daily living activities, making the person dependent on their caregiver. Present data shows that 44 million of people globally suffer from dementia [2]. It has a significant economic impact on the world's health care systems. Dementia is one of the most common causes of disability and dependency among older adults. Therefore, it is necessary to implement strategies early in adult life, to either prevent or delay the onset of the first symptoms. This review will summarize the existing evidence supporting the role of modifiable factors in prevention of cognitive impairment in elderly.

Risk factors for cognitive impairment

The risk factors for dementia are categorized into two main groups: modifiable and non-modifiable. The former includes age, genetic status and family history. Among risk factors for dementia, age has one of the strongest impact [3]. Possession of a first degree relative with AD increases the possibility of developing the disease. There is no control over these aspects, however we can shift focus onto factors we can change. Modifiable risk factors will be further discussed and the importance of recognizing and modifying them is the aim of this article.

It has been proven that hypertension, diabetes, hypercholesterolemia, obesity, metabolic syndrome and depression increase the probability of developing dementia. They are considered modifiable risk factors, alongside with vitamin and nutritional deficiencies, unhealthy dietary habits, physical inactivity, heavy alcohol consumption and smoking. Furthermore, it has been proven that the process of inflammation has negative effect on cognitive function. A diet rich in saturated fat and refined sugar impairs memory and are associated with increased proinflammatory cytokine production [4]. Chronic state of low-grade inflammation has been observed in obesity, cardiovascular disease and type 2 diabetes [5]. It is fundamental to take care of physical condition and overall health. Appropriate protective measures of premature aging should be implemented early in adult life, in order to receive better results and keep cognitive function in senility.

Approaches which focus on decreasing measures of free radicals and cholesterol through proper dietary patterns and exercise have the properties to delay neurocognitive deficits [6]. It is important to emphasize, oblivescence should not be ignored among elders and should raise awareness among medical practitioners. All patients with first worrying symptoms of cognitive function impairment, should be provided by in depth diagnostic.

Effects of inflammation

Proinflammatory cytokines affect brain function and their elevated levels are associated with neurodegenerative dementia. The study by Reichenberg et al. indicated that immune system activation by endotoxin administration, resulted in decreased performance in memory tests. Stimulated cytokine secretion also demonstrated a temporary significant increase in the levels of depressed mood in participants of the study [7]. Depression has also been associated with dementia occurrence in senescence [8].

There is evidence that markers of inflammation increase their levels in the plasma of an aging brain that corresponds with memory deficits [9]. Elevated mediators of inflammation was also linked with risk factors of dementia like sedentary lifestyle, obesity and smoking [9]. Knowledge of the negative effects of inflammation resulted in the search for dietary components that have the potential to decrease proinflammatory cytokine production. Diet is one of the major component of a healthy lifestyle, and anti-inflammatory and antioxidant properties of food can potentially protect the human brain function. Dietary pattern rich in anti-inflammatory constituents, such as Mediterranean diet, can reduce serum concentrations of inflammation markers [10]. Furthermore, regular physical exercise is associated with decrease in proinflammatory cytokines levels: TNF- α , IL-6, CRP in elderly [11].

Exercise benefits cognitive performance

The number of people with sedentary lifestyles is continuously growing globally, which poses a serious public health threat. Physical inactivity can have serious implications and leads to a long list of diseases, such as cardiovascular disease, type 2 diabetes, lipid disorders, obesity, depression. Being physically active regularly has been proven to be a major factor in the protection of brain function. Minimum 150 minutes of moderate to vigorous physical activity per week is recommended [12]. It is beneficial when done regularly, for that reason a person should choose an activity they will enjoy in the long term. The form of exercise should be adjusted to physical capabilities of an older adult.

Cognitive and physical activity be pivotal to maintain intellectual activity until a late age. Combining both forms of exercise showed better results in comparison to physical exercise alone. This strategy not only improves cognitive function in older adults with dementia, but also delays the progression of cognitive deficits [13]. It also improved performance of daily living activities and mood in elders. In the study by Howard et al., intellectual stimulation in the form of reading, solving crossword puzzles and craftwork presented to have protective effect on cognitive impairment. Involvement with computer activities, participation in educational courses and the process of learning new skills are also considered protective factors against cognitive decline [14].

Ability to cope with stress could also be important, as well as maintaining social interactions. Social engagement can prevent cognitive impairment [15]. As the human brain ages, loss of neuronal tissue is observed, especially in areas of frontal, parietal and temporal cortices [16]. This process is accompanied by a corresponding decline in cognitive functions. Exercises that elevates the heart rate can reduce the loss of brain tissue [17]. Performing both mental and physical activity has the ability to increase cognitive function [6].

Healthy diet improves cognitive function

Polyphenols have antioxidant and anti-inflammatory activity. They can be found in dietary plant products, such as vegetables, fruits, coffee, tea, cocoa and many others. They have proven positive effect on memory, lower blood pressure and cholesterol. In the study by Lamport et al. it was reported that older adults with supplementation of polyphenols had beneficial effect on cognition. Polyphenols are divided into subclasses. One of the common polyphenols found in the diet are flavanols. Consumption of flavanols in the form of cocoa drink, increases the perfusion in anterior cingulate cortex and regions of the parietal lobe by stimulating vasodilation via nitric oxide [18]. Polyphenols have positive impact on memory and learning by improving nerve cell function and regeneration of neural tissue [19]. A diet high in polyphenol rich food is an essential element of healthy and balanced nutrition.

Older adults with high blood pressure (HBP) have a greater risk of developing neurocognitive deficits. The study by Smith et al. illustrated that the dietary approaches to stop hypertension (DASH) combined with calorie restriction and cardiovascular exercise, enhanced the neurocognitive function and psychomotor skills in overweight participants with HBP, as compared to the control group [20]. DASH diet is based on high intake of fruits and vegetables, whole grains, low fat dairy products, limited consumption of saturated fat and cholesterol from red meat, as well

as low intake of sodium. Comparatively to the DASH diet, Mediterranean diet has similar dietary patterns. Mediterranean diet also has the properties to reduce inflammation, increase levels of polyphenols in serum and reduce the production of free radicals [21]. It is based on traditional eating habits of Greece and Southern Italy and focuses on consumption of olive oil, nuts, legumes, fresh greens, fruits and fish. In moderation, cheese and wine are also included in this style of eating. Research showed that older adults following a Mediterranean diet supplemented with healthy sources of fat like olive oil, may prevent age-related cognitive dysfunction [22].

Hypercholesterolemia increases levels of oxidative stress, which is responsible for impairing neuronal function. AD is characterized by aggregation of beta-amyloid protein in the brain. High concentration of cholesterol in serum has been associated with increased beta-amyloid accumulation and cholesterol levels correlate with the severity of AD [6]. Diets which focus on replacing saturated fat with healthy sources of fat, such as nuts, seeds, olive oil, avocados, lower triglycerides and cholesterol levels.

A balanced diet should include healthy acids, which are found in fish, flaxseed, canola and soybean oil or dietary supplements, for instance fish oil. They are associated with protection from cognitive dysfunction and AD [23]. Omega-3 polyunsaturated fatty acids, such as linoleic and alpha-linolenic acid (ALA), come from plant based products. These two acids cannot be synthesized by the human body and they need to be supplemented externally through food. Deficiencies in omega-3 are an important risk factor in the development of neurological disorders. ALA effect may be mediated through increase in brain-derived neurotrophic factor (BDNF) [24]. BDNF is a regulator of neural development and it is responsible for differentiation and maintenance of brain cells. Omega-3 fatty acids have many health benefits and they are a fundamental component for proper function of the central nervous system.

Conclusions

Currently there are 50 million people with AD and other forms of dementia living in the world. Without the right strategies of prevention put into practice, the numbers are predicted to triple by the year 2050 [25]. It is a major health concern with huge implications for growing populations. The most promising strategy to prevent early onset of first cognitive dysfunction symptoms, is to raise awareness about modifiable risk factors and underline the importance of minimalizing them early in adult life. It is implausible that one factor alone plays a dominant role in reducing the risk of dementia. Creating healthy dietary patterns have the potential to protect the human brain against cognitive decline which occurs during ageing. Maintaining intellectual activity until a late age and regular cardiovascular exercise, has been proven to protect the brain function. Minimalizing the risk of dementia in senility is a multidisciplinary approach.

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SEVERE HYPERPHOSPHATEMIA AS THE ADVERSE EFFECT OF SODIUM-PHOSPHATE ENEMAS USE: CASE REPORT AND REVIEW OF THE LITERATURE

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Abstract:

Constipation is among the most common complaints in GP's office affecting over 10% of children reporting to the doctor [1]. Due to 2020 Covid-19 pandemic, the access to specialist care and treatment has become difficult what led to neglect of managing chronic diseases and delay in diagnosis. We present a case of a 10-year old girl that was admitted to the Emergency Department (ED) with symptoms of severe constipation and abdominal pain with a history of ongoing constipation and diarrhea for about 6 months. In the ED she was given a sodium-phosphate enema twice. After a few hours she developed life-threatening hyperphosphatemia, hypocalcaemia and metabolic acidosis. The presented patient is an example of a severe, chronic and unfortunately mistreated constipation with an extremely rare side effect of a sodium-phosphate enema. We find it important to underline that monitoring after the procedure, quick and proper treatment, if the mentioned effect occurs, can save patient's life.

Keywords:

constipation, enema, hyperphosphatemia, children, telemedicine

Introduction

Constipation is one of 10 most common problems encountered by general pediatricians [2]. It is manifested as infrequent bowel evacuation, large stools, difficult or painful defecation, however soiling may also be observed. The incontinence of the stool is frequently mistaken for diarrhea. Parental concern is often high. In prevention of chronic constipation, the non-pharmacological treatment can be launched, including high-fiber diet, increased fluid intake, parents and child education, toilet training, regular physical activity, biofeedback and psychological consultation [3, 4]. In long-term conditions clinicians examine pediatric patients searching for abnormalities in gastrointestinal, metabolic, endocrine or nervous system and if there is no pathology, they diagnose them with functional constipation, referring to ROME IV criteria [5].

The pharmacological approach is based on various substances administered orally or rectally and on the maintenance therapy [6]. Both oral laxatives such as mineral oils, polyethylene glycol 3350, lactulose, lactitol and rectal treatment including glycerol, bisacodyl suppositories, phosphate,

saline or mineral oil enemas have been shown to be effective and are considered to be safe. On the contrary soap and water or magnesium enemas should be avoided and there's been several fatal hypermagnesaemia cases reported in medical literature [2, 7]. Sodium-phosphate enemas are among the most frequently used in Emergency Departments [4]. Although the efficiency of oral laxatives and enemas is proved to be equal, rectal laxatives are preferred due to quick relief of symptoms [8].

Phosphate enema (commercially known as Rectanal®, Enema® in Poland, Fleet®, Travad®, Fletcher's® in English speaking countries) contains osmotically active substance: sodium acid phosphate and sodium phosphate. It prevents water reabsorption in the intestine lumen, increase the volume of the stool, which stimulates rectal motility. Rectal sodium phosphate is extemporaneously prescribed in constipation, before endoscopic examination, surgery or labor. There are numerous contraindications such as bowel obstruction or perforation, acute kidney failure, appendicitis, hypertension and congestive heart failure. According to manufacturer's advice, it shouldn't be used in young children (<3 years) and dehydrated patients [9]. The adverse effects of phosphate enema in pediatric patients include nausea, abdominal pain and distention, water-electrolyte imbalance (dehydration due to osmotic activity of the drug, hypocalcaemia, hyponatremia, hypokalemia, and metabolic acidosis), tetany, QT prolongation, neurological abnormalities, bone mineralization anomaly and intravascular hemolysis [10]. Phosphorus is mainly absorbed in duodenum and jejunum, however absorption in colon is also possible [11].

Here we present a case of a 10 years old patient who developed a life threatening hyperphosphatemia as an adverse effect to sodium-phosphate enema administration and summarize the findings on other similar cases in the medical literature. We emphasize the laboratory and clinical manifestations observed in the pediatric case of severe hyperphosphatemia and discuss the approach in emergency departments and various methods of constipation prevention among children.

We accessed the MEDLINE database looking for similar cases in available literature in Polish and English language. The search used the various key words associated with the subject, cumulative such as „sodium-phosphate enema/laxatives/enema” and „children/pediatric/infant” and „adverse effect/side effect” or „hyperphosphatemia”. The findings exemplify the hypothesis of the hyperphosphatemia as an extremely rare adverse effect of sodium-phosphate enema treatment.

Case Report

A 10-year old girl who had been suffering from constipation and diarrhea for about 6 months was admitted to the hospital. Before admission she was treated by her GP (using telemedicine technology because of COVID-19 pandemic). During her previous visits encopresis and fecal soiling (resulting from chronic constipation) were misdiagnosed as diarrhea and she was treated with antidiarrheals. Her last bowel movement was 3 weeks before the admission. She complained of loss of appetite, nausea and vomiting for a couple of days before.

In the ED she was admitted with symptoms of severe constipation and abdominal pain. On admission she was alert and awake. Her vital signs were as follows: heart rate 113 beats per minute; respiratory rate 18 per minute; oxygen saturation 97%; blood pressure 119/80 mmHg. Clinical examination revealed abdominal rigidity, muscle guarding and palpable resistance caused

by fecal masses. Her mucous membranes were dry and aphthae were present. Her past medical history included asthma, regularly treated with β_2 adrenergic receptor agonists inhalers. Child's development was normal and in her medical records no potential underlying cause of constipation could be found.

Because of fecal masses in her abdomen she was given two sodium-phosphate enemas – both with poor effect. During laxatives administration she gave a large amount of loose stool and vomited. Shortly after that she became lethargic, weak and confused. Tetany, dehydration, anisocoria and tachycardia (130BPM) appeared. Laboratory results showed severe ionic abnormalities. She developed life-threatening hyperphosphatemia and (as a result of calcium binding) hypocalcaemia. Other irregularities included hyperkalemia and hyponatremia. Moreover, arterial blood gas analysis revealed decompensated metabolic acidosis. Of note were the phosphate level of 9.35mmol/L, sodium level of 156 mmol/L and pH – 7.16. The total calcium level was 1.18mmol/L. Tab. 1 and Tab. 2 shows laboratory results of hyperphosphatemia and metabolic acidosis as they were developing. Later on, during her hospital stay, she underwent computed tomography (CT) of head that didn't show any abnormalities. Intravenous fluid therapy was started with a 650 ml of multi-electrolyte fluid and 10 ml of calcium chloride in 100 ml of 0.9% sodium chloride. Other drugs included ondansetron, No-Spa, 500 ml of 10% glucose and 12 units of insulin.

Tab. 1. Time related changes of ions after enema administration (on day 1 at 18:45) during hospital stay

[mmol/L]	Ref. Range	Day 1 20:00	Day 1 23:00	Day 2 05:00	Day 2 13:00	Day 3 0:00	Day 3 6:21	Day 3 17:11
Sodium	135-145	156	148	145	145	132	134	140
Potassium	3.5-4.5	6.1	4.27	3.8	4.38	5.2	5.64	3.79
Calcium	2.19-2.69	1.41	1.24	-	1.49	1.74	2.28	2.01
Ionized Calcium	1.12-1.32	0.29	0.45	0.61	0.72	1.06	1.35	1.26
Phosphate	1.05-1.70	-	9.35	5.93	1.88	1.33	1.1	0.63
Magnesium	0.7-0.86	0.92	0.85	1.12	0.93	0.88	0.8	0.69

Source: Patient's medical record

Because previous actions weren't successful she was qualified for urgent cecostomy (manual evacuation of stool). After the surgery she was transferred to the pediatric intensive care unit, where she stayed under general anesthesia and mechanical ventilation. During next hours she was analgo-sedated, anti-oedema drugs and intravenous fluid therapy was applied, diuresis was forced. The following morning the patient was stable and successfully extubated, therefore could be discharged from the pediatric ICU.

Tab. 2. Arterial blood gas analysis after enema admission (on day 1 at 18:45) during hospital stay

	Ref. Range	Day 1 20:00	Day 1 23:00	Day 2 5:00	Day 2 13:00
pH	7.35-7.45	7.16	7.22	7.35	7.416
pCO₂ [mmHg]	35-45	38	38.7	35	35.4
pO₂ [mmHg]	80-100	64	64.1	164	77.4
sO₂ [%]	94-98	85	83.4	99	95.7
HCO₃⁻ [mmol/L]	21-26	13.5	15.6	19.3	22.2
BE (B) [mmol/L]	-3 - 3	-14.4	-11.3	-5.6	-1.7

Source: Patient's medical record

Discussion

Sodium phosphate enema is widely used in pediatric and adult patients and is generally regarded as safe. Rectal laxatives treat constipation and promote bowel evacuation before diagnostic and surgical procedures [12]. It is reported that only a small group of patients is predisposed to phosphate enemas side effects. If adverse effects occur, they develop due to hyperosmotic dehydration and hyperphosphatemia (secondary to increased absorption or decreased elimination of phosphorus in the rectum). The study analyzing water-electrolyte complications after application of sodium-phosphate enema before sigmoidoscopy showed tendency to increased concentration of phosphorus serum level but within normal range [11]. Systematic review of 29 pediatric cases has shown that water-electrolyte imbalance, tetany, neurological manifestation, QT prolongation, bone mineralization abnormalities, acute renal or respiratory failure and intravascular hemolysis are in the adverse effect's spectrum. The mortality rate in the mentioned group was 13.8% with reported higher risk of deaths in patients with comorbidities [10].

Our patient presents extremely rare case of developing classical side effects with no coexisting conditions, although Núñez Sánchez reported a case of generally healthy girl aged 2 years and 7 months who has been given sodium-phosphate enema twice due to constipation. After two hours she presented painful hypertonia of the upper and lower extremities and her laboratory tests showed hyperphosphatemia (12.24 mmol/L), hypocalcaemia (4.2 mg/dl) and metabolic acidosis (pH = 7.27) [13]. Literature review showed that complications after enemas are more common in children with gastroenterological conditions; for example Hirschprung's disease or with renal dysfunction [13].

Wason described the reaction of 5 months old female to mistakenly administered entire content of Adult Fleet®. The girl suffered from neurological disturbances as well as metabolic complications (hyperphosphatemia: 14.3 mmol/L, hypocalcaemia: 4.2 mg/dL, acidosis: pH= 7.28). She was lethargic during admission to the hospital, then unresponsive to pain [14]. According to up to date guidelines and manufacturer's advise, the sodium-phosphate enemas shouldn't be used under the age of 3 [9]. Those information are worth sharing among clinicians worldwide in order to prevent life-threatening complications in the youngest patients.

Rectal laxatives should be only prescribed extemporaneously. Becknell described a 4 year old male with a medical history of anorectoplasty for imperforate anus and constipation received

sodium-phosphate enemas twice a day, three times a week for eight months. On the day of admission he became "weak" and unresponsive. 15 minutes after regular dosage he developed hyperphosphatemia (21.02 mmol/L), hypocalcaemia (2.4 mg/dL) and metabolic acidosis (pH=7.09). Standard fluid resuscitation didn't have a desired effect [12].

The majority of presented patients suffering from adverse effects of enema were primarily dehydrated. We believe that the mucous examination and capillary refill time in hydration assessment shouldn't be omitted while deciding on enemas administration either in children or in adults.

It is worth noticing that some patients, including presented by us 10-year-old girl, develop severe water-electrolyte disturbances in occasional treatment, while others that receive rectal laxatives repeatedly never show the symptoms. This fact brings a question on whether there are any genetic predispositions or immune hypersensitivity that indicates higher risk of complications associated with treatment. Ladenhauf report could be considered as the hypothesis advantage, as it observed similar pathological reaction to sodium-phosphate enema in previously healthy siblings aged 5 and 2.5 on 6 months duration [15].

As adverse effects can be fatal in some cases, it is crucial to establish diagnosis and implement proper treatment in water-electrolyte disturbances in order to prevent cardio-pulmonary and renal failure. Second-look examination, should be a standard procedure after enema administration.

The alternative management in severe constipation is administration of oral laxatives, as it is less invasive and more acceptable by children. The major disadvantage of the method is delayed symptoms relief; however it is proven to be equally effective. The most common oral laxative is PEG (Polyethylene glycol) [16].

It is important to acknowledge that presented 10-year-old girl developed severe constipation during the pandemic of Covid-19. All of the health centers in Poland established a phone consultation as a great compromise between giving a piece of solid medical advice and minimalizing the risk of contact between mildly sick and potentially seriously ill patients [17]. Telemedicine has many advantages: patients have access to specialists who are not available in their community, there is no time or distance barrier and it helps to reduce the number of unnecessary transports [18]. On the contrary giving medical advice indirectly can lead to miscommunication between patient and a doctor. The message given by the parents may not be correct; they may misinterpret the symptoms and condition of their child. On the other hand the doctor may have a problem with receiving the message, and interpret it incorrectly. This could have happened in presented case. It's hard for parents (usually not associated with medicine) to recognize symptoms of constipation properly and only a few know that soiling can be one of them [19]. Our patient's parents reported soiling to GP who didn't have a chance to examine the patient in person what led to misdiagnosis and prescribing loperamide – an intestinal μ -opioid receptor agonist [20] that possess anti-secretory properties and blocks intestinal sodium channels [21]. With no doubt epidemiological situation in the country delayed transferring patient to the pediatric gastroenterologist. There are no available guidelines for GPs on how to manage chronic constipation that doesn't respond to the standard treatment and when to address the specialist.

Conclusion

Sodium-phosphate enema is a standard treatment in chronic constipation with proven efficiency. Adverse effects among children can lead to life-threatening metabolic complications. It must be taken under doctor's consideration during prescribing laxatives in general. The use of sodium-phosphate enemas in pediatric emergency departments should be minimized with implementing other methods such as oral laxatives. If there is no alternative available it is obligatory to monitor patient's vital signs in search of hyperphosphatemia symptoms and launch fluid resuscitation or renal replacement therapy if needed. This complication is extremely rare but was repeatedly reported in medical literature therefore should be acknowledged by doctors worldwide.

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BIRTH CONTROL, FAMILY PLANNING AND ABORTION IN DEVELOPING COUNTRIES ON THE CASE STUDY OF SAMOA

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Abstract:

Complex analysis of current situation of family planning, birth control and abortion trends in Samoa. As a small country situated in the Oceania with around 140 000 inhabitants that gained the independence in 1997 is still struggling with social issues. According to newest data as one of the most religious Christian counties consider family as important part of social life. Although big families are part of the cultural structure of the country it is essential to discuss the lack of family planning and birth control knowledge especially among young part of the population. Government social programs that tends to help young people in the subject of starting family are insufficient and often poorly exercised.

Keywords:

abortion, family planning, inequality, Samoa

Introduction

In this paper I would like to discuss the issues of birth control policy, family planning, abortion and general reproductive issues of a developing country on the example of Samoa. It is a very interesting case for a research because of the isolation of the islands, history, customs and culture of the people inhabiting this region, also the religion plays an important role in the lives of Samoans. The aim of this essay is to address the struggles, solutions and predictions for the future that Samoan people and government are coming across in the field of birth control policies. As a developing country, with relatively high population growth and expected rise of the birth numbers in accordance to death rate, improving policies considering the household outlining are an important matter.

Education and development of country's facilities, schools, hospitals are important but also knowledge and sexual awareness are key elements for maintaining conscious society. That is why I want to present current level of education and awareness about birth control methods among people, especially in their reproductive age which is between 15 and 49 years old.

In this short article I would like to gather the most essential information related to sexual education in the field of birth control, family planning and abortion. As for such small nation the

idea of family and having a descendant is really important in their tradition. Customs, culture and religion impacts the decision on the new policies or upgrading the old laws, for example the issue of abortion and it's almost total prohibition.

Samoa as a developing country

Samoa, with its capital in Apia is an islands nation in Oceania in the South Pacific Ocean. It has two official languages: English and Samoan. It is consisting of two, big, main islands: Savaii, Upolu - with 3/4 of the population living there [1] - and a couple of smaller sized land parts that are mostly periodically inhabited such as Manono, Namua, Aleipata, Apolima [2]. It functions as a first independent country of South Pacific islands since 1st January 1962 [3].

Till the year 2014 Samoa was on the United Nations list of Least Developed Countries. With its GNI per capita being 4,124\$ for year 2018 and constantly growing Samoa's economy is expanding and improving each year [4]. Also, with its Human Development Index being 0.713 ranks it at 104th position worldwide [5].

Samoa has a majority of the characteristics of developing country economy such as low levels of living and productivity, low levels of industrialisation and manufactured exports, adverse geography, underdeveloped markets, colonial impacts and unequal international relations [6]. That is also why economy is based on international overseas aid. As an island country, geographically situated in a region of tropical downpours and tsunamis, with the last one that had hit east coast of both Upolu and Savaii on 29th September 2009 [5], main focus of the economy is on agricultural sector. Most of crops are coconuts and copra, which are also the main products of islands export. To harvest those almost 80% of natural rainforest were cut out and reversed into tillage. Taking into account that the entire land area is 3000 sq. km big, that is a massive loss for the unique natural environment of the archipelago.

Low level of industrialisation, with only one developed industry branch which is the production of auto-motive wire harnesses and closed market, are not only the outcome of geographic issues but also an impact of the colonial times. Especially when we take into account that from the middle of nineteenth century till beginning of twentieth century the decision-making countries about the future of Samoa were Great Britain, Germany and United States. In the year 1914 New Zealand took over the influence at the archipelago, what was changed in 1947 when League of Nations established Samoa as its trust territory.

As a developing country on the other hand Samoa is slowly but effectively expanding its industrial potential. This development, on the other hand affects badly natural environment of the island and unique and wild coastline [7].

Samoa's population and its growth

Back in the year 2011 Samoa was inhabited by 187 820 people. The division of man in accordance to woman are on the level of 90,830 females and 96,990 males. Percentage of people in their reproductive age (which is between 15 and 49 years old) was measured and set to be 47% of all women and almost 48% of all men inhabiting the archipelago. Total Fertility Rate was set to be 4.7 child per woman, which is the highest number among all of the Pacific Ocean islands. All this

numbers and measures gave the equation in which the number of people entering the reproductive age in next years will be higher than the number of the population past this period. Scholars assumptions were predicting the increase of population to 190 000 till the year 2015 [8]. This numbers shows that the current situation of the archipelago is the demographic growth.

Referring to July 2017 demographics of Samoa which was over 200 000 [1] inhabitants shows that the number is constantly growing. Also, the disparity between births and deaths still remains big. Taking it all to the account the statistic shows that for every 1 000 people there are 20.4 births per year [9] (birth rate) and 5.3 deaths [10] (death rate), which still gives the increase of approximately 15.1 people for every 1 000 inhabitants.

Birth control policy and family planning

Given the fact that almost 1/4 of Samoa's population are women in their bearing age the awareness about variety of birth control is relatively low, numbers show that this occurrence is visible in both groups - male and female. Contraceptive methods can be divided into two groups: traditional and modern.

The traditional list is consisted of periodical abstinence method, withdrawn method, the lactational amenorrhea method (LAM) and other folk methods.

The modern one contains oral birth control pills and injectable contraceptives, male and female condoms, sterilisation (both for women and men), contraceptive implants, emergency contraceptive pill, intrauterine device (IUCD) and the lactational amenorrhea method (LAM) [8].

Statistics shows that even if majority of the population in the reproductive age - around 70% of females and over 80% of males - are aware of at least one modern birth control method only 30% of female and 15% of male respondents admitted using them. Surveys also showed that among young women (at the age of their twenties) prevention of pregnancy is much lower than in the age range of 30-40 [8].

Most common method of birth control are male condoms. Numbers shows that percentage of man that knows and use this method is even 20% higher than females [11].

The method of intrauterine device is the least common long-term methods of contraception, both because of the lack of the spread of the awareness and also the cultural issues and beliefs. Only 7% of the respondents can name it [11].

The use of sterilisation, especially female one, cause in the case of males it was used rarely, is slowly disappearing. Started from 1990's usage of this method is fading [8]. Speaking of male sterilisation only 1% of man ever used it, it is also connected with traditional values and customs of man-empowerment and status [11].

When it comes to the emergency contraceptive pill numbers are very low both when we talk about the usage and the awareness. Only 0.1% of women of reproductive age admitted that they used the so called "the day after" or "emergency pill" and less then 5% of females in their conceptive stage acknowledge the existence of this method of pregnancy prevalence [12].

The education, location of living and wealth level is also an important issue when speaking about birth control methods. Statistics shows that highest awareness and knowledge about prevalence of unwanted pregnancy or just postponing the family planning time have women that

are: educated, from urban areas and also with highest material status in the permanent 5th quintile [8].

Researches shows that with the passing time the number of women using contraceptive methods is dropping in all age groups. That can be caused by various factors such as:

- health/family planning policies do not satisfy or convince the society
- it is the issue of bad sexual education and the low level of spreading the awareness of birth control methods [8].

Usage and knowledge of traditional birth control methods, such as LAM or withdrawn method, is higher among married woman. But in general usage of contraceptive methods is larger in the group of married women that already have children. Research shows that over 37% of women with 5 or more kids use any birth control method in comparison to only 1% of married females that haven't conceived a baby yet [11].

Accessibility to birth control methods is wide and government centred. Most contraceptives are prescribed in government hospitals - 67% of all the prescriptions. It is followed by government health centres and family planning clinics around Upolu and Savai'i. When it comes to private sector the percentage of woman using private health care to get contraceptives is around 2%, so it is relatively low. Also, the outlay for the most methods are covered by government or are not higher than the fee for the medical consult [11].

Family planning initiative is one of government's main concerns for now and for the future. The knowledge and issues concerned with awareness of people and possibilities are spread by lots of official governmental programmes but also NGOs programmes or Samoan Red Cross. Most common and effective way of spreading the information are media. Television commercials and radio ones are the most efficient, the least effective ones are commercials in magazines and newspapers. In general knowledge and exposure to the family planning information and initiatives rise proportionally to the level of education and wealth quintile [11].

Abortion in Samoa

Abortion is prohibited in Samoa. In the light of law there are only two cases when it can be done: "An authorised abortion is an abortion performed by a physician upon a consenting woman under the following conditions:

- (1) the life of the patient would be endangered by continuance of the pregnancy; or
- (2) the continuance of the pregnancy would substantially impair the physical or mental health of the patient." [13].

Apart from this 2 cases impregnation can be terminated not after the 20th week of the pregnancy [14].

According to Samoa's prime minister, that is a representative of government, admission of that act is a sin [15]. Taking into the account that this country is very closely tied with religion, Christianity is the major religion [1], so as in many other developing or even some developed countries with religious background, abortion is prohibited. Also, any medical practices or doctors providing or helping with proceeding the abortion on demand are prohibited and can be punished by law [13]. According to "UN Human Rights Council Independent expert group on the issue of

discrimination against women in law and in practice” the unsafe abortion still takes place in villages and especially rural areas and are done in a risky way [16].

Conclusion

The aim of this term paper was to examine how Samoan government is working on family planning activities and how this action influence society in the area of outlining a household. Authorities are popularising knowledge about birth control methods and family planning programmes. This is an important matter because reports show that Samoa is an archipelago with the majority of people in their reproductive age and the numbers will grow during the next years. Traditional model of big family is still a strong cultural issue. That’s is also why young people, especially women, do not use that often birth control protections. On the other hand, the occurrence of usage of contraceptive is much more visible in the age section of women in their thirties or among those that have already 5 or more kids. Traditional values, culture and religion has huge impact on family planning in Samoa, but that doesn't impact education about birth control methods. Although it affects perception of people about abortion which is prohibited, excluding only 2 cases. That on the other hand do not stop people, especially in the rural areas of the archipelago, to perform illegal, hazardous abortions. Reports shows that majority of young people are aware of at least one of them, but also same numbers shows that only 1/3 of research participants are using any contraceptive method.

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POLITICAL CHANGES IN POLAND AFTER 1989

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Abstract:

Political changes in Poland constitute an extremely interesting research field. Warsaw above all sought independence from Moscow. In order to transform the system from the communist system to a democratic system with a free market economy, many significant changes were needed. The office of president and institutions of the Senate were restored. In addition, a new constitution was established as a result of the compromise.

Key words:

democracy, free market economy, Lech Wałęsa

Introduction

A landmark event in the history of Poland was the Round Table meeting (February 6, 1989), where political reforms were the most important. The power's goal was to persuade the opposition to participate in the so-called non-confrontational parliamentary elections to make the first step towards incorporating it into the political system of the People's Republic of Poland without violating its foundations [1]. Generally, the process of democratic change in Poland can be divided into three periods: 1989 - the fall of communism in the Polish state, 1989-1991 - the creation of democratic procedures and institutions, and further after 1991 - the consolidation of democracy. In the years 1989–1991 significant political transformations took place, which are the basis for the democratic system - at that time political institutions were established, such as the Senate, municipal councils or the office of the president [2]. In addition, in 1992 the so-called a small constitution which defined the powers of the executive and legislative authorities [3].

Stages of political changes

The authorities of the Polish People's Republic (PPR) and the opposition could not agree on the scope of competences regarding the office of the president, electoral law and the scope of competences and mutual relations between the Sejm and the Senate (this institution was to return to the Polish political scene after a break of almost 45 years). The opposition agreed on the undemocratic specificity of the election, although it demanded that the electoral law should apply to only one parliamentary term, while subsequent elections would be free. In turn, the authorities sought not only to allocate seats properly, but also to influence who would represent the democratic opposition. Undoubtedly, Aleksander Kwasniewski's initiative was a blow to the Polish United

Workers' Party, which proposed that elections to the Senate be free, which in fact was not previously agreed with the party's leadership. Aleksander Kwasniewski decided to take this step in order to break the deadlock in the dialogue with the opposition regarding the issue of the distribution of seats in the Sejm. In exchange for consent to free elections to the Senate, Solidarność agreed to split seats in the Sejm in a ratio of 65:35 in favor of the communists, although in the initial phase of negotiations Solidarność sought a division in the ratio 60:40 [4].

The Round Table played an important role in the process of democratization of Poland primarily due to the fact that as a result of its provisions there were changes in the structure of central authorities. Despite the fact that the principle of the separation of powers was not introduced into the constitution, changes were introduced which were a manifestation of this principle, namely the president's office (which was previously liquidated in 1952) and the Senate were restored, and the National Council of the Judiciary was established, the principle of the irremovability of judges was introduced and the law on associations was adopted in 1989. The purpose of establishing the office of the president was not to refer to the tradition of the political system, but the communists treated it as a tool for controlling the transformation process and it was clear that it was the PZPR representative who would perform this function. The president received the right of veto, dissolution of the Sejm before the end of the term of office, as well as supervisory powers over local authorities. In addition, the president had the right to dissolve the Sejm if it passed a law that would prevent him from exercising his constitutional rights. As mentioned before, another institution that was revived was the Senate. In this case, too, no traditions of the past were invoked, but the initiative was taken to restore it due to the deadlock during the round table talks, which was fueled by the distribution of seats in the Sejm. Thus, a bicameral parliament was created, where the Sejm as the lower house remained the main institution of the legislative process and the place of political debate, while the Senate was given the power to table amendments, although the Sejm could reject them. As for issues related to the judiciary, the National Council for the Judiciary was established and the principle of the irremovability of judges was introduced, which was a step towards establishing the independence of judges and the independence of the courts [5]. However, the quality of the judges was a problem, which left much to be desired. An important event was also the adoption of the Law on Associations on April 7, 1989, which in fact enabled the creation of a political party [6]. The most important result of the Round Table was the agreement that allowed for the first elections in Central and Eastern Europe [7].

The election was held on June 4, 1989 with a turnout of 62%. The PUWP authorities sought to ensure that parliamentary elections were held as soon as possible to take advantage of the rapid loss of support for Mieczysław Rakowski's government. In addition, it was important that the other party didn't have too much time to organize the campaign. However, it should be noted that the election ended in a defeat for the ruling coalition - the candidates of the Citizens' Committee obtained 160 seats in the Sejm out of 161 possible. The election to the Senate ended with the crushing victory of the opposition - it won 92 seats and eight, which lacked the required majority, entered the second round. The authorities did not obtain any seat in the Senate, and the required majority for the Sejm was won by only three candidates, and this only thanks to the unofficial support of Solidarity. Under previous arrangements, the remaining 296 seats were to be filled after the second round of parliamentary elections. The ruling coalition also suffered a defeat in terms of

the national list, which included the majority of the candidates forming the coalition, where of the 35 candidates on the national list only two received over 50% of the vote, which meant that the remaining 33 seats would be vacant. The fall of the national list caused a serious imbalance of the ruling coalition's advantage [8]. The second round of elections took place on June 18, 1989, and the turnout was only 25%. As a result of these elections, Solidarity received the only missing parliamentary seat and seven senatorial seats (out of 8 possible). Piotr Baumgart was the only candidate who failed, and he was defeated by Henryk Stokłosa, who declared himself an independent candidate, although in reality he was associated with the power camp. H. Stokłosa is a candidate from Piła, whose election campaign was considered the most expensive in the history of the Polish People's Republic. It is estimated that he allocated 100 million zlotys for his campaign, thanks to which he was able to organize a rally, which included a lottery with a tractor and TV as the main prize [9]. In connection with corruption allegations, in 2013 he was sentenced to 8 years imprisonment and a fine of 600,000, although a year later the court of appeals set aside this judgment [10]. It is also interesting that the leaders of the opposition camp appealed to vote for some candidates from the ruling coalition's lists, and they mainly meant people who expressed different views than the party leadership. Support was granted to 55 MPs, including 21 MPs from the PZPR. The June elections marked the beginning of the Third Polish Republic, although the leaders of Solidarity did not take advantage of the enormous social support they enjoyed in the elections. Above all, the possibility of repression and violence by the authorities was feared, and for this reason no action was taken to depart from the contract concluded at the "Round Table".

On July 19, 1989, the National Assembly elected President Wojciech Jaruzelski as president, although earlier a proposal was made to divide the executive between the ruling coalition and the opposition. On August 17, 1989, a coalition of the Civic Parliamentary Club was formed, which brought together the Citizens' Committee together with two parties from the former ruling coalition - ZSL and SD, which resulted in the creation of the first non-communist government in Central and Eastern Europe on August 24, 1989, headed by Tadeusz Mazowiecki as the prime minister. In the new government, the communists received two departments - the Ministry of National Defense and the Ministry of the Interior. Ministers-generals Florian Siwicki and Czesław Kiszczak lost their positions only in July 1990 as a result of the total loss of power and influence by the communists. Then the communist party dissolved and a new social-democratic party was created - Social Democracy of the Republic of Poland, which was transformed in 1999 into the Democratic Left Alliance.

In 1990, presidential elections were ordered, which were won by Lech Wałęsa in the second round. L. Wałęsa's opponent in the second round of elections was Stanisław Tymiński. At first, there were many indications that S. Tyminski was in a lost position and the mere fact that he had collected enough signatures to register his candidacy was a surprise. This entrepreneur was considered an outsider without any political background, although thanks to effective criticism of the elite he gained the sympathy of a significant part of the electorate. In addition, television helped him create himself as a patriot-billionaire who would sacrifice everything for the good of his homeland [11]. However, in the second round of presidential elections Lech Wałęsa won by a clear majority, who received 74.25% support [12]. L. Wałęsa, in contrast to Prime Minister Tadeusz Mazowiecki, was in favor of accelerating reforms. The presidential election was important because

it showed then that, unlike other Central and Eastern European countries, we were dealing with a situation where the only central state body derived from full free general elections is the office of the president, not the parliament. Officially, the Polish People's Republic collapsed on December 29, 1989, when changes to the constitution were introduced and a new name for the state was introduced - the Republic of Poland. These amendments highlight the democratic nature of the state where the nation is a sovereign and exercises supreme power through the Sejm and Senate. In addition, provisions on the alliance with the USSR, the leading role of the PZPR, planned economy and socialism were abolished, the possibility of free founding of political parties was introduced, and the former national emblem was restored [13].

The issue of local self-government was also raised, when in March 1990 the act on municipal self-government was adopted [14]. This act was modeled on the European Charter of Local Self-Government, because almost from the beginning of the existence of the Third Republic of Poland the desire to join European structures was declared and to this end it was necessary to adapt national law to Community law. In addition, the electoral law was adopted, which created the conditions for political rivalry. The first free elections to municipal councils were held in May 1990 and this initiated the rebuilding of local government in Poland [15].

Despite the arrangements at the Round Table that free parliamentary elections would be held in 1993, they were ultimately held in 1991. The elections were held at a time when the Polish political scene was fragmented, which was unfavorable from the perspective of stabilizing the political system. The situation was not conducive to the electoral law, which did not set the electoral threshold. As a result of the elections, 29 groups got into the Sejm, of which 7 received only one seat each, and the victorious Democratic Union obtained only slightly more than 12%. In such conditions, the creation of a majority coalition became impossible. The problem was that there were many different political formations of different orientations on the Polish political scene. The result was that power was exercised only by minority cabinets, which were unable to maintain power for a longer period of time. Eventually, as a result of a vote of no confidence, the terms of office of the Sejm were shortened and early elections were ordered in 1993.

In the context of considering Poland's accession to NATO, it is necessary to mention the government of Prime Minister Jan Olszewski, whose government operated from December 6, 1991 to June 5, 1992 [16]. It was during the rule of Prime Minister J. Olszewski that for the first time the official documents of the Ministry of National Defense contained a provision stating that membership in NATO is a strategic goal of Polish defense policy. During the exercise of power by J. Olszewski's government, inter alia, decision to accelerate negotiations aimed at withdrawing Russian troops from the territory of the Polish state. On May 22, 1992, Prime Minister Olszewski protested against the conclusion of the Polish-Russian treaty on friendship and good-neighborly cooperation, stating that the bases, abandoned by Russian troops withdrawing from Poland, would be transferred to international Polish-Russian companies. Prime Minister Olszewski forwarded the government's protest by sending a message to President L. Wałęsa, who, after talking to Boris Yeltsin, changed this controversial provision in the contract. However, after a change in the concept of privatization of state-owned enterprises, where the privatization process was almost completely stopped, the government conflicted with liberal formations in parliament. In addition, there was a conflict between the government and the president, which really contributed to the collapse of the

office of Prime Minister Olszewski. The Sejm, during the night vote on June 4-5, 1992, several hours after the implementation of the resolution of the Sejm by the Minister of the Interior, Antoni Macierewicz, regarding the disclosure of secret collaborators of the Security Services, decided to dismiss the government [17]. After the fall of Prime Minister Olszewski's cabinet, President Wałęsa entrusted the mission of forming a new government to PSL leader Waldemar Pawlak [18].

The basis for the functioning of each state is the constitution. In Poland, work on the new constitution was begun in December 1989, but from the beginning, due to the presentation of various concepts, mainly related to the political system of the state, they went very slowly. The Sejm proposed a parliamentary and cabinet system, while the Senate believed that the role of the president should be strengthened. The matter of adopting the constitution was prolonged primarily because it was said that the Contract Sejm was not fully democratic and it should not have adopted a new constitution. On October 17, 1992, the so-called a small constitution, which was to ensure the functioning of state organs and was binding until the new constitution was established. The adoption of a small constitution did not mean the repeal the 1952 constitution, although some articles regulated by the new law were repealed. The small constitution was defective in that we were dealing with a vague and illegible division of powers between the president and the government. This could lead to rivalry and conflicts, especially in a situation where the president and government were from opposing political camps. The adoption of this act should, however, be considered a success of the Sejm of the first term because, despite the shortcomings of this act, it was progress towards shaping the new political order [19]. After the parliamentary elections in 1993, when the Democratic Left Alliance won and Lech Walesa was the president, we faced a situation where executive power was exercised by two different political parties, which led to numerous frictions on the president-government line. Conflicts between the two parties lasted until 1995, i.e. until the victory in the presidential election by Aleksander Kwasniewski, who was a DLA candidate. The small constitution did not specify the division of powers with respect to the executive authorities, thus constituting a source of conflict.

On May 25, 1997, a constitutional referendum took place, where 6.3 million people against 5.5 million were in favor of adopting its shape adopted by parliament. Finally, the constitution of the Third Republic of Poland was adopted on April 2, 1997, and after the Supreme Court confirmed the validity of the referendum and after the President signed the Basic Law, it entered into force on October 17, 1997 [20]. The new constitution strengthened the role of the prime minister, the position of the government in relation to the Sejm and the president, the role of the Constitutional Tribunal in relation to the legislative power, as well as the role of the Sejm in relation to the Senate, while weakened the role of the president in relation to the government and the Sejm.

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FLOW CYTOMETRIC ANALYSIS OF MICROORGANISMS

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Abstract:

Flow cytometry is an old technique, which is commonly associated with studies of mammalian cells. However, historically this method was primarily utilized to research on air-borne microorganisms. Now, the microbial application of flow cytometry is undergoing a renaissance. The technique is a perfect tool for studying phytoplankton communities, describing water quality during its treatment, and detecting pathogens in clinical samples. The range of applications is extending. This review describes briefly how useful method flow cytometry is now.

Keywords:

flow cytometry, environmental microbiology, clinical microbiology

Introduction

Flow cytometry is a diagnostic tool based on fluorescence. With this method, cell populations can be rapidly described using single-cell characteristic properties [1]. The technique enables researchers to perform multiparametric analysis of up to 50.000 cells per second [2]. During procedure, cells are counted and sorted due to their size and labelled proteins (that occur both embedded in membranes and within cells). Cells are suspended in a liquid sample and then passed through a beam of strong light. Subsequently, light scattering and fluorescence are detected and recorded as a file [3]. The data can be displayed in several ways: as monoparametric or biparametric histograms as well as three-dimensional representations [1]. Scattered light is dependent on cell size and its complexity (surface roughness and number of organelles). To get more information, the sample has to be stained with fluorochromes. There is a plurality of fluorescent stains and they are diverse in their mechanisms of action. Some of them bind to specific cellular compartments or compounds (e.g. propidium iodide (PI) interacts with nucleic acids), whereas fluorescence of others depends on physiological parameters (for instance – pH) or enzymatic activity [1]. Under particular circumstances there are possibilities to use autofluorescence of cells, because many cellular compounds have natural fluorescent properties. NAD(P)H is a perfect instance which can be excited with UV-radiation and produces blue fluorescence as a result [2].

The first flow cytometer was developed in 1947 by Gucker et al. [4]. The main aim of new instrument was analysis of dust particles suspended in air and detection of bacteria and spores [5]. Currently flow cytometry is mainly recommended as tool for clinical studies: diagnosis of blood,

typing of leukemia and lymphoma, stem cells, monitoring of treatment. However, for several years now, the need to evaluate the material quickly and accurately, has raised the interest of microbiologists when it comes to flow cytometry.

Microbiology is commonly believed to be interested in research at the population level. Information about gene expression patterns, metabolic pathways, cell differentiation, and adaptation to changeable environmental conditions was inferred from data obtained by studies on bacterial populations [3]. It turned out that single-cell methods are essential to gain understanding of processes which take place in natural environments like chemical communication between microorganisms, bacterial surface colonization and biofilm development or interspecies gene transfer [7-9]. Single-cell techniques give a whole new perspective on microbial heterogeneity at four different levels. There are plenty of mechanisms of genetic variability (e.g. spontaneous mutations, transduction, transposition, duplications) which are the cause of genetic heterogeneity (i). Cells within a population can also differ in macromolecule composition and enzymes activity that can be referred to as biochemical and metabolic heterogeneity (ii). There is physiological variation (iii) in size, shape as well as envelope's and intracellular compartments' structure of bacterial cell. As a consequence of above differences, the behavioral heterogeneity (iv) can be distinguished. Individual cells may respond variously to chemotactic and phototactic stimuli, swim in different directions and at unequal speed [3].

Applications of Flow Cytometry to Environmental Microbiology

As it was mentioned in the introduction, analysis of bacteria with the use of flow cytometry is based mainly on their autofluorescence and metabolic activity. For the analysis of bacterial strains, cytometers have to show a high resolution of measurement. This makes it possible to measure bacterial titers in liquids and thus to determine the microflora of rivers and lakes, drinking water and body fluids. Such measurements are extremely important and helpful in hydrobiology, determination of the suitability of water for a particular use and in medical determination of infections [10] (Fig. 1.).

Questions to pose

Living or dead? Active or non-active?

Environmental microbiologists are often posing questions about how a particular change in environmental conditions affects studied populations. Flow cytometry has impact on redefining the concept of microbial "viability" [11].

The first method that enabled scientists to distinguish the quantity of dead cells from the living ones, used the reaction catalyzed by active bacterial and beetle luciferase. The idea is extremely simple: luciferase produces light in an ATP-dependent reaction and the mentioned nucleoside triphosphate is present only in living and catabolically active cells. Therefore, as long as additional ATP is not added, detected light reflects the number of viable cells [12]. However, under some circumstances not all living cells have to be catabolically active and the luciferase-based method can lead to false conclusions [13].

Lehtinen et al. [13] decided to use more precise method of bacterial viability measurement based on green fluorescent protein (GFP) and a DNA-binding red dye (PI), which passively

penetrates only the disintegrated membrane of dead cells. A jellyfish dye which is currently called GFP was encoded within a plasmid and introduced into *Escherichia coli* cells. Later staining with PI was carried out and red and green fluorescence was measured by flow cytometry which enabled the separation of different LIVE/DEAD fractions according to membrane integrity.

Nebe-von-Caron et al. [11] used multi-color flow cytometric analysis to describe stages beyond the standard LIFE/DEAD division. It turns out that there are many intermediate states between vivid and non-vivid cells. As a consequence, the term "viability" makes no sense anymore.

Another approach is based on the evaluation of amount of nucleic acids within a single cell. It was observed that the higher is a nucleic acid content, the more copies of the genome are localized within a cell, so the replication rate is faster. Because the environment varies in different ecosystems this method may give incorrect results under certain conditions. Therefore, the application of this method requires the establishment of standards specific to the environment under investigation [14].

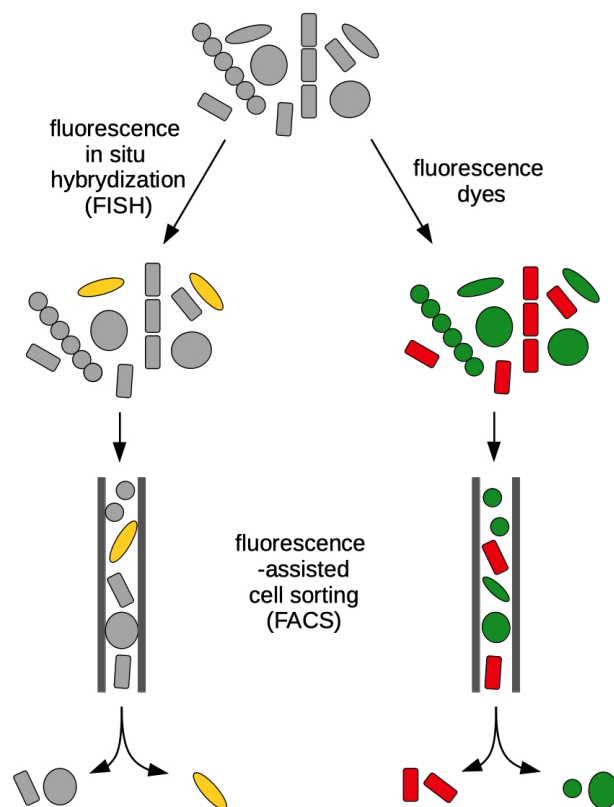


Fig. 1. Different ways to use the flow cytometry and the fluorescence-assisted cell sorting in environmental microbiology

Source: [10], modified

Can the living cells be distinguished from the dead ones?

Fluorescence activated cell sorting (FACS) is a technique that enables researchers to separate selected cells from a heterogeneous population. Generally, in a sample cells differ in qualitative and quantitative characterization of expressed proteins. Some of them are present on the surface of a cell. They can be specifically bound by fluorescence-conjugated antibodies and later detected by the

flow cytometer. As a consequence, from the absence or presence of a light signal the phenotype of a particular cell can be inferred [15]. In a similar way, there is a possibility to distinguish metabolically active cells from a non-active subpopulation. After the sorting stage, these subpopulations can be characterized genetically, biochemically, and phylogenetically [10]. FACS has been applied for example to research on fecal bacteria's diversity [16], microorganisms enable diesel fuel degradation [17], transformation of organic compounds in seawater [18]. Due to its precision and reading speed, flow cytometry is increasingly used in the environmental, industrial microbiology and medical fields.

Is it possible to sort by specific nucleic acid targets?

Recently, there has been a need to test unusual strains of bacteria or strains of bacteria that are present in low density. The sorting function in flow cytometers is very helpful here. First the method called fluorescence in situ hybridization (FISH) provides an opportunity for detecting cells which contain specific nucleic sequences (Fig. 1.). Subsequently, objects of our interest are sorted. Miyauchi et al. utilized specific probes for *Candidatus Accumulibacter phosphatis* to concentrate this species by flow cytometric sorting with a purity up to 97% [19]. However, the success of this strategy in case of environmental samples is limited [10].

Which types of environments can be investigated by the flow cytometry?

Analysis of oligotrophic environments

The method of quantification by flow cytometry was developed by Hammes et al. [20] and is used for counting microbial cells in an oligotrophic environment (e.g. in drinking water). It is the most frequently used method in industry to control the purity of bottled and tap water. It allows to monitor for the titer of planktonic bacterial cells, which occur there naturally [21]. Moreover, sewage treatment plants may determine the total concentration of cells, which may be an appropriate parameter to describe water quality during treatment [20].

Analysis of marine microbes

The study of taxonomy of marine microorganisms is critical in many areas from ecology to medicine. Flow cytometry is perfectly suited for this purpose. FACS can analyze the small (tenths of a micron) and large (tenths of a millimeter) objects in parallel. This method enables scientists to keep the observed organisms alive and return them to the environment. Marine environments are quite easy to examine by the flow cytometry. Keeping phytoplankton alive in an aqueous solution is not as difficult as it is in case of some mammalian cells for instance. Moreover, many marine microorganisms contain fluorophores which can be detected and helpful for phylogenetic classification [22]. Flow cytometry analyses of marine microorganisms allowed discoveries of new taxa. *Prochlorococcus mariunus* is an excellent example [23]. In spite of extreme abundance, this species of cyanobacteria was unnoticed using classical microscopic techniques due to its size and susceptibility to photobleaching [22]. The discovery of *P. mariunus* has changed common understanding of food webs [23]. Between 2006 and 2007, as part of the Galathea 3 scientific expedition, sea water samples were taken from various corners of the world. These samples were used to isolate marine bacteria and, as a result, active compounds, which were then subjected to biological tests for their potential growth inhibitory properties of pathogenic microorganisms.

Research on marine environments has lit the light on how crucial ecological contribution of autotrophic plankton components to the global carbon cycle is [22].

Analysis of consortia with regard to degradation

There is little information about microbial interactions, which occur almost in all ecosystems. The main reason for this appears to be the difficulty of determining specific roles of particular consortium members and number of various interactions which could occur, e.g. mutualism, parasitism, commensalism, amensalism, competition, predation. Nevertheless, it is essential to determine the profile of efficiently functioning microorganisms present in the studied ecosystem. This is the key to environmental monitoring: changes occurring naturally in ecosystems or under the influence of human activities. Multiparametric flow cytometry can also be useful in this area of research. This method gives a deep insight into consortium functioning at a single-cell level. Vogt et al. carried out an investigation into the anoxic microbial consortium's population dynamics using flow cytometry. Bacteria classified to the toluene-mineralizing and sulphate-reducing species *Desulfobacula toluolica* and a strain of *Cellulosimicrobium* or a strain referred as MV1 compromised the consortium. The results suggested commensalistic relations between mentioned microorganisms [24].

Applications of Flow Cytometry to Clinical Microbiology

Classical microbiology diagnostic techniques have some disadvantages. One of them is that relatively long time is required for the results to be acquired. The material taken from the patient must be cultured to visualize what kind of pathogens and how many are present, so a diagnosis cannot be given within few hours. However, flow cytometry enables medical laboratory workers to conduct one or more of type of microbe detection in a fast way. Their identification is based on the analysis of light scattering or fluorescence. Specific antibodies or lectins conjugated with fluorochromes are used for the assay. It is very helpfully when that pathogens might not be culturable [1]. Flow cytometry is used to identify a wide range of microorganisms. These include for instance *Salmonella* spp. [25], *Mycobacterium* spp. [26], *Mycoplasma fermentas* [27], *Pseudomonas aeruginosa* [26]. Pathogenic fungi, parasites like *Leishmania* [28] or *Plasmodium* [29], and virus-infected cells can also be detected using flow cytometry technique [30].

Applications of Flow Cytometry to Industry

Practices, which are now used to provide microbiological safety, have to be very fast and sensitive to the presence of well-known hazardous microorganisms. During the industry processes, food products have contact with harmful organisms. Therefore, due to the high risk of the presence of unknown pathogens the industry processes are under constant control. This is necessary in order to quickly address the pollution or contamination [32]. Flow cytometric method enables detection of potentially hazardous microorganisms and their characterization. For instance, Xue et al. described a detection of *Shigella* and *E. coli* cells in the food industry [33], while Juzwa et al. created a flow cytometry-based procedure for detecting adherent bacteria from food-processing surfaces [34].

In this case, the main advantages of using flow cytometry techniques are: cell sorting which makes it possible to isolate the microbiological strain and determination of the metabolic activity of the cells. These are the key parameters for the selection of agents used against the pathogenic microorganisms [34].

Summary

Flow cytometry is a highly versatile technique. The range of its applications to environmental, clinical, and industrial microbiology is astonishing. It was estimated that less than 2% of microorganisms living in natural environmental conditions can be cultured in the laboratory [35]. Despite difficulties in culturing, microorganisms' populations can be studied using the flow cytometry what may be considered to be the main advantage of this technique. The others include studying heterogenous populations of cells, the possibility to sort them, and absolute accuracy level. On the other hand, there must be some disadvantages. The cost of equipment in contrast to alternative methods is a definite minus. Flow cytometry analysis provides an overwhelming amount of information. In some experiments not even a half of them is needed. As a consequence, alternative and cheaper techniques may be more appealing. Finally, while the flow cytometry procedure usually does not take a lot of time, the sorting stage may be time-consuming.

Flow cytometry is a highly versatile technique. The range of its applications to environmental, clinical, and industrial microbiology is astonishing. FACS allows us to do analyzes of microorganisms that cannot be cultured in the laboratory [35].

Other advantages of this technique include speed, sensitivity and accuracy of measurements as well as the possibility of examing and sorting live microorganisms. Cytometric analysis of microorganisms is not without challenges. To effectively detect the characteristic elements that microbes possess, cytometers have to be carefully engineered for this use. Finally, flow cytometry procedure usually does not take a lot of time, while the sorting stage may be time-consuming. As a consequence, alternative and cheaper techniques may be more appealing. Nevertheless, manufacturers are racing to improve quality of the cytometers. The equipment has to be smaller, work in the field and to be more open to the needs of users. Flow cytometry has considerable potential for becoming a revolutionary method to research microbial populations.

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PREDICTORS OF STRESS-RELATED DISORDERS IN THE PROFESSIONAL ACTIVITY OF NURSES AND TEACHERS

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Abstract:

Stress is ubiquitous, it is severely experienced by nurses, teachers and other social groups in contact with other people. An important element that plays a fundamental role in the perception of work-related stress is emotional intelligence, thanks to which people recognize their own emotional states and other people's emotional states. The aim of the study was to find out the opinions on the predictors of the occurrence of stress-related disorders in the professional activity of nurses and teachers. In order to carry out the study, the method of diagnostic survey was used, the original questionnaire was used as a research tool. Research has shown that in 78% of respondents, stress manifests itself as a reaction of the body, e.g. in the form of insomnia, 92 people among the respondents consider their profession as stressful, but they would not change it, as many as 88% of respondents never benefited from psychological care.

Keywords:

predictors, stress, professional activity, teacher, nurse / arz

Introduction

Nowadays, the concept of stress in the workplace is becoming more and more common. Most working people, from blue collar to corporate employee, encounter this phenomenon. However, our research focused on two occupational groups: teachers and nurses. It is worth considering the question: what is stress? It is an inherent element of human life, which in moderate doses increases the efficiency of the human body and is able to push it to more difficult tasks. However, it cannot be in too large amounts, because its excess can lead to many diseases: starting from heart diseases and ending with mental problems. Stress in the workplace is most often caused by too many tasks and problems with their performance. If it is long-lasting, it may result in addictions in the employee, and also cause burnout [1]. The concept of occupational burnout appears more and more often in the field of problems related to the workplace. It is also known as Burnout syndrome as a result of long-term stress in the workplace and most often occurs in occupations that require contact with another person. Sometimes, however, it may appear in a person who was almost a workaholic, but suddenly her professional career stopped and stopped giving her joy [2]. According to Christina Maslach, there are three components to burnout. Those are:

- emotional exhaustion, i.e. a feeling of emptiness and lack of all strength to work,
- depersonalization, i.e. a sense of impersonality, evaluating others in a cynical way,
- lowering the assessment of own achievements - a sense of wasting time and effort while working [3].

According to A.M. Pines and E. Aronson "burnout is a state of physical, emotional and mental exhaustion caused by long-term involvement in emotionally stressful situations" [4]. Therefore, it can be concluded that burnout is a state characterized by frustration, exhaustion, loss of emotional energy, decreased physical strength, all of which result in a lack of motivation to work with commitment that prevailed before. It is worth knowing, however, that this phenomenon is not ordinary fatigue, because despite work fatigue, one can still derive satisfaction from it, and a professionally burned out person will gradually lose this satisfaction and motivation to perform it [8, 10].

It should be mentioned that the discussed phenomenon will occur in a person who started work full of motivation and wonderful ideas, and not in a person who was cool from the beginning. In the former, when the expected fulfillment does not appear, the level of satisfaction will begin to decline and a lack of will and motivation (just professional burnout) will begin to appear, while in the latter, it will be just stress that can be easily overcome. Burnout occurs only in those people who expect work to be the meaning of their lives [5, 11].

The phenomenon of occupational burnout is characterized by five stages:

1. "Physiological" stage - this is the phase of physiological symptoms, ie pain, ailment, loss of appetite, exhaustion, trouble sleeping.
2. Social stage - this is the stage characterized by: irritability, isolation, insecurity in interpersonal relationships, grievances and regret towards others.
3. Intellectual stage - in this stage, cognitive processes are disturbed, which is manifested by difficulties in receiving and transmitting information and making mistakes in logical thinking.
4. Psychoemotional stage - behavioral changes appear at this stage, such as alcohol, tobacco and drug abuse, drug use, neglecting one's duties, decreasing responsibility and sense of risk.
5. Spiritual stage - this phase is associated with the loss of faith in basic principles and values, manifests itself with an internal void and lack of interest in other people [6,9].

It is worth emphasizing that the transition from one stage to the other is fluid and often takes place outside the consciousness of the individual. However, a person suffering from burnout syndrome always experiences bodily, emotional, intellectual and spiritual exhaustion. Importantly, these problems occur both in terms of professional life and in leisure time. Thus, they influence the behavior of an individual in the workplace, but also the family environment [7, 12, 13].

Materials and methods

The method of diagnostic survey was used to obtain the research material, the survey technique was used and the survey questionnaire was constructed independently. The original questionnaire was sent out and completed by nurses and teachers via e-mail. The criteria for selecting these two groups were women and men professionally active as teachers and nurses. The survey was conducted among 25 teachers and 25 nurses. The survey questionnaire consisted of 20 questions,

5 of which were open-ended questions, including multiple choice. The questionnaire contained questions, including about:

- gender
- age
- marital status
- seniority
- place where the profession is performed
- the type of behavior that each of the respondents presents
- ways of coping with stress and the associations associated with it
- own assessments of coping with stressful situations and descriptions of emerging stress responses
- descriptions of the events most influencing the occurrence of stress at work
- places, people and institutions where they seek help in coping with stress

On the basis of the survey, own analyzes were carried out on various aspects of professional work, the reaction to the appearance of stress and occupational burnout.

Results

The analysis of the survey questionnaire showed that significantly more women than men took part in the survey. There were as many as 88% of women and 12% of men (Fig. 1).

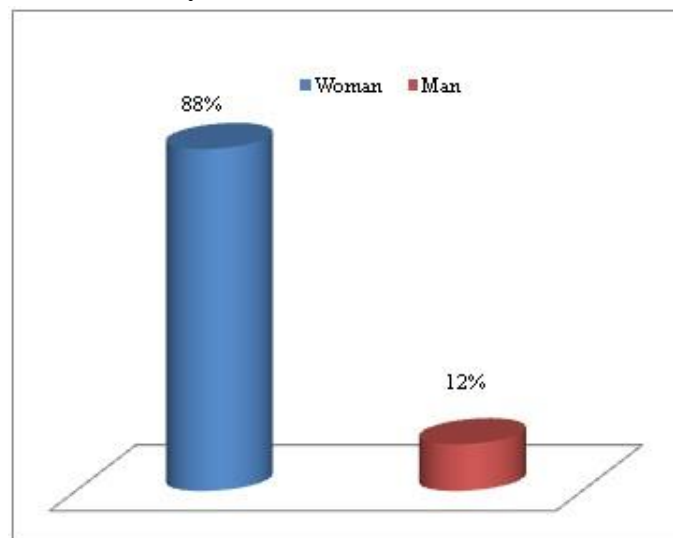


Fig. 1. Sex

Source: Data collected on the basis of surveys

It is not surprising that such a distribution of results is that both of these professions are strongly feminized.

Two age groups prevailed in the research: 23-29 years old and 30-39 years old. People aged 40-49 and over 50 constitute a significant minority (Fig. 2).

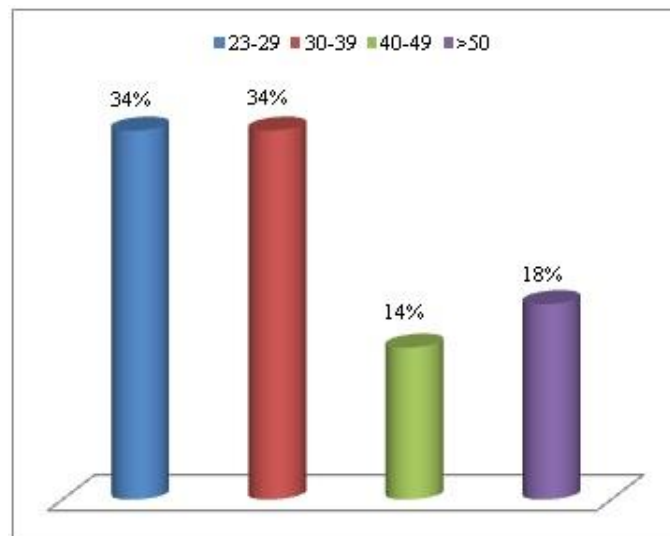


Fig. 2. Age

Source: Data collected on the basis of surveys

The above list shows that younger people are more willing to take part in online research, although it is commonly believed that the nursing profession, due to its specificity and low wages, is represented by the older generation.

The vast majority of the respondents are people in long-term relationships, they constitute 48% of the respondents, the next are people without partners, they constitute 44%, at the end there are divorced people, this is 8% of the respondents (Fig. 3).

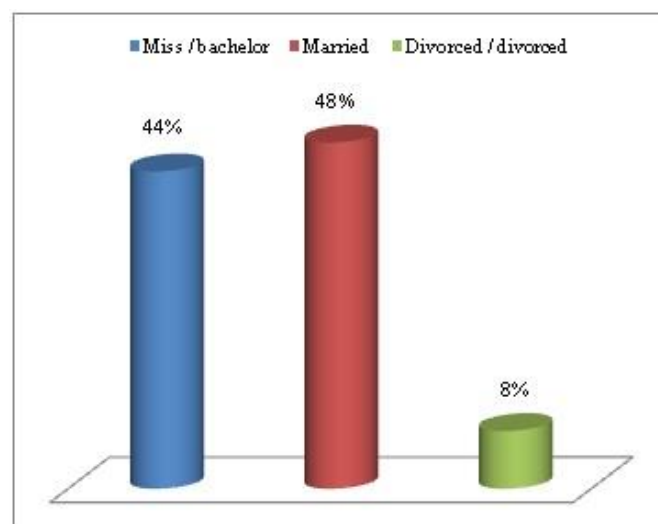


Fig. 3. Marital status

Source: Data collected on the basis of surveys

The workplace of the vast majority of teachers participating in the survey is primary school. It is as much as 60% of the surveyed teachers. Teachers working in secondary schools are next, and they account for 22%. 10% of preschool educators and 7% of lecturers. Plus SP teachers constitute 1% (Fig. 4).

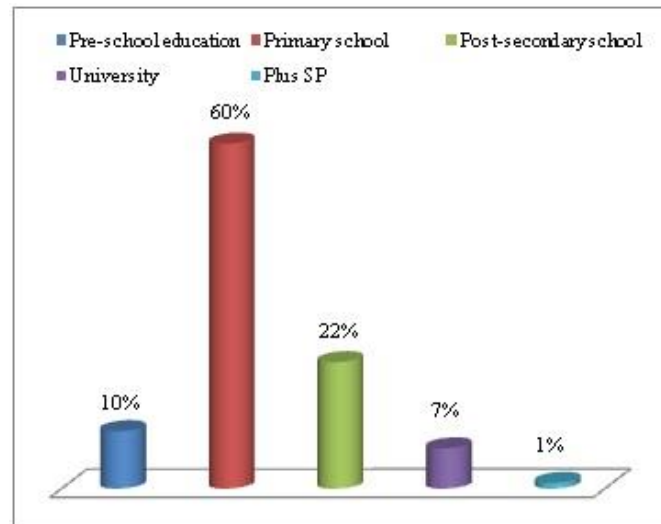


Fig. 4. Type of school where you work? (question directed to teachers)

Source: Data collected on the basis of surveys

As many as 64% of the surveyed nurses work in a hospital. The next most frequented workplace is the clinic with 24% of people working there. 8% of the surveyed medical workers work in DPS, and 3% in Health Care Centers. 1% of respondents work in hospital clinics (Fig. 5).

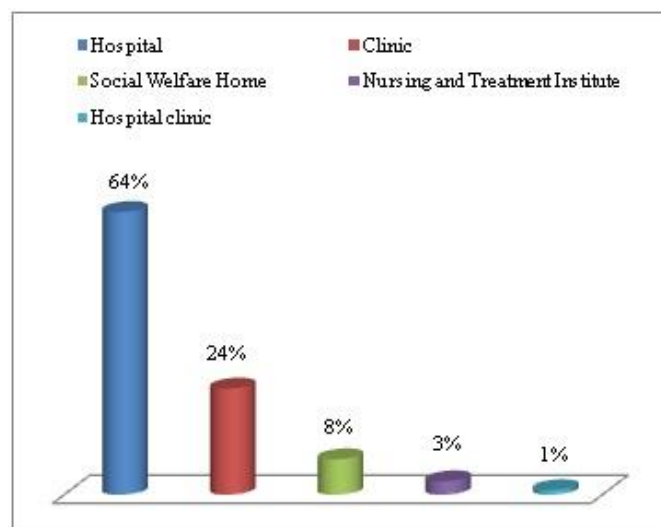


Fig. 5. Your workplace (question addressed to nurses)

Source: Data collected on the basis of surveys

The essence of the research carried out is the conclusion that the majority of respondents claim that they can cope with stress, of these people being 52%. There are 11% of people who cannot cope with stress and this is disturbing because it can lead to the previously discussed burnout or other disorders. The result that says that there are 26% of people who do not know if they are coping is completely bizarre. The ambivalence that accompanies us in life is now a natural phenomenon (although it was still considered a disorder in the 90s), it seems that it should not occur

in professional life. Of course, the prognosis can be good, compared to other studies, and there is a growing awareness of stress at work (Fig. 6).

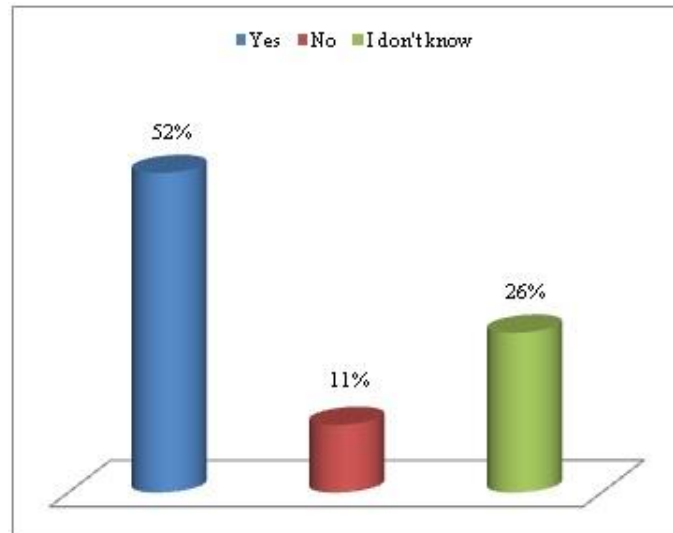


Fig. 6. Do you deal with stress at work?

Source: Data collected on the basis of surveys

The vast majority of respondents claim that their work is stressful and there are as many as 92% of these people. Only 6% of people who do not think so are, and 2% of people who do not know. This allows us to conclude that, in the opinion of the respondents, the professions of teachers and nurses are considered a source of stress (Fig.7).

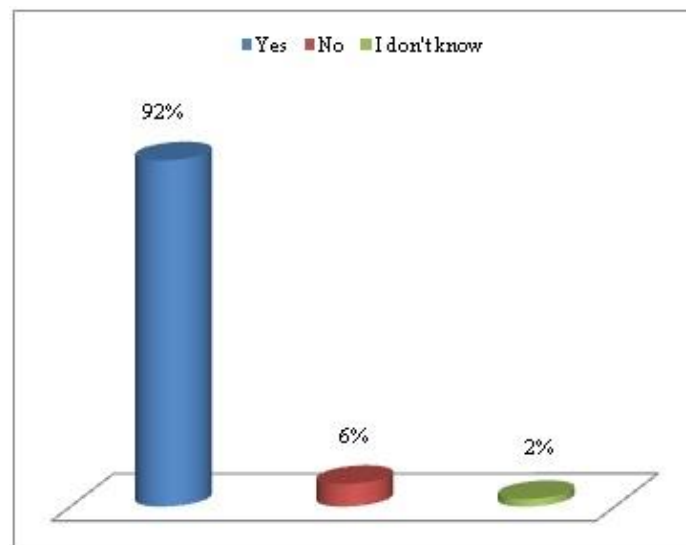


Fig. 7. Do you find the teaching / nursing profession stressful?

Source: Data collected on the basis of surveys

Certainly it is encouraging that such important and socially responsible professions by the majority of respondents declare that if they had the opportunity to re-choose a profession, they

would choose the same profession again and there are 58% of these people. There are 10% of people who would not like to work as teachers or nurses a second time. 32% of people are undecided. It can be assumed that this proves a conscious choice of a profession and pursuing it as a vocation (Fig. 8).

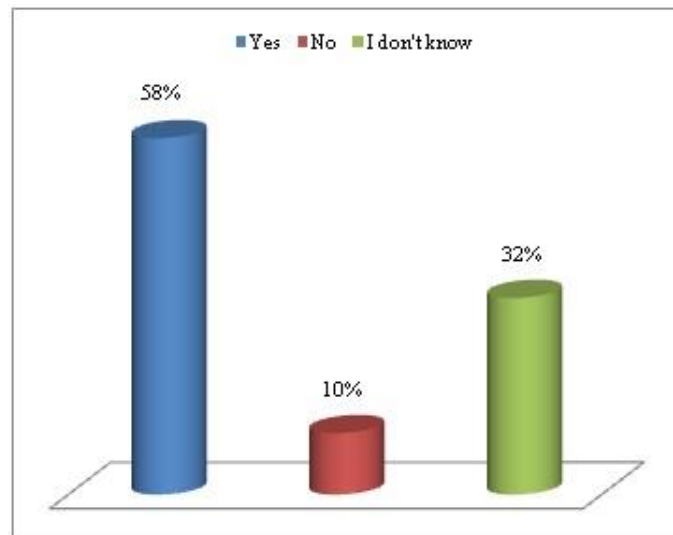


Fig. 8. Would you choose your profession again?

Source: Data collected on the basis of surveys

The result is very worrying that the vast majority of respondents declare that they sometimes feel bad getting up in the morning for work, and it is 58% of people. People who often feel this way constitute 20% of the studied group. 18% of people rarely experience fatigue, and only 4% of people who never experience such a feeling. It is clear here that many people are on the verge of burnout, which qualifies them for psychological help (Fig. 9).

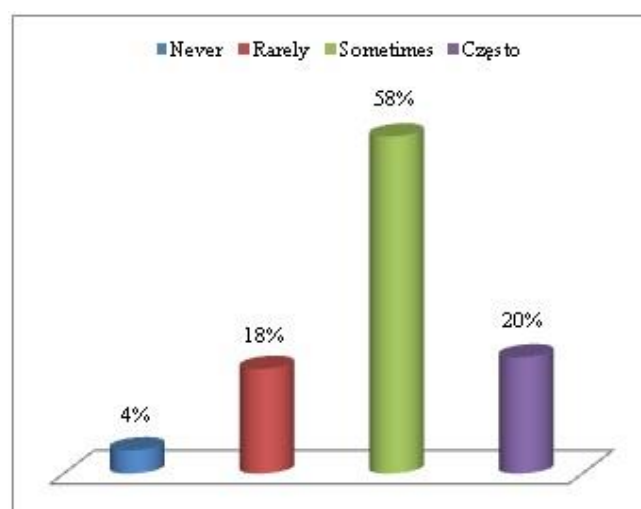


Fig. 9. Do I feel tired / tired when I get up in the morning and am forced to face another day at work?

Source: Data collected on the basis of surveys

Most of the respondents declare that they never use psychological help and there are as many as 88% of these people. 10% of respondents visit a psychologist several times a year, and only 2% a few times a month. Analyzing the answers to this question, it can be concluded that there is still reluctance or fear or ignorance in our society about the possibility of using a psychologist (Fig. 10).

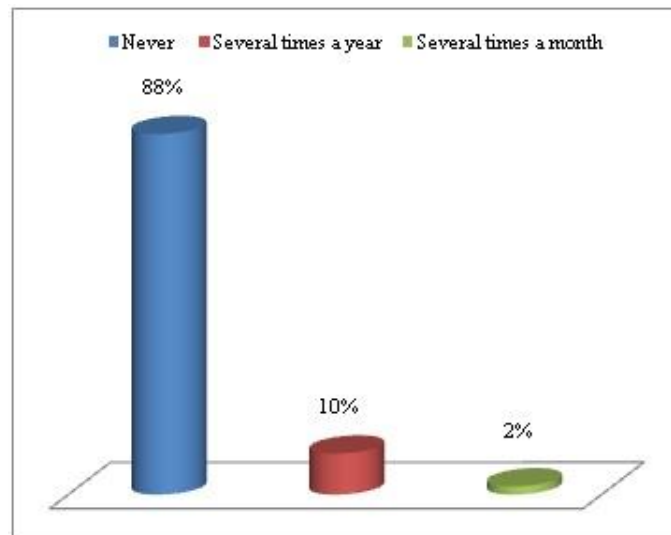


Fig. 10. How often do you use psychological care?

Source: Data collected on the basis of survey

The analysis of open-ended, multiple-choice questions allows us to conclude that, when asked about the length of service in the research, a significant number of people whose length of service did not exceed 10 years prevailed. There are 30% of these people. Next, there were people whose work experience did not exceed 2 years, these were 26%. There were 16% of people who worked in the profession for 20 years, and those who worked up to 29 and at the same time up to 41 years were equally - 12% for each group of seniority. When asking respondents what they associate stress with, most of the respondents associate stress mainly with nervousness. Basically all persons mentioned factors such as hand trembling, fatigue, anger. It can therefore be concluded that many people associate stress mainly with physical symptoms. We can also distinguish typical professional responses, i.e. the association of stress with exams, hospitalizations, or the death of a patient or a serious accident. Stress is negatively associated by all respondents. When asked "why did they choose such a profession", the respondents stated that the main reason for taking up such a job was the willingness to help or the willingness to change. This is due to having noble ideas that accompany a young person during and after graduation.

Many people were also guided by the possibility of working with people, which proves the high interpersonal skills of the respondents. There were also replies that it was a dream job. The next question related to the reaction to stress, the majority of respondents declared that as a result of stress they experience body reactions, such as insomnia. Such ailments were noted by 78% of respondents. Then there were uncontrollable emotions and other disorders such as problems with concentration. Both these categories accounted for 54% of the respondents.

Only 20% chose unusual behavior such as workaholism. There are single answers such as: sweating, problem with decision making and panic attack after a stressful situation. It can be concluded from this question that the vast majority of people react to stress purely physiologically, followed by emotional disturbances. The last question asked of the respondents was to find out where they look for help in connection with stress in their professional life, the respondents usually declared that they seek help from their friends in case of professional problems, 54% of the respondents chose this answer. 48% of people choose to talk to family members, and 46% seek help from colleagues. Only 18% of people seek help from their superiors, and only 16% from a specialist. 8% of respondents do not seek help at all, which may be surprising nowadays.

Conclusion

On the basis of the research results obtained in the group of nurses and teachers, it can be seen that the profession of nurse and teacher is stressful, while the vast majority of the respondents would choose the same profession if they had the opportunity to choose the same profession again, this was declared by more than half of the respondents. In both professional groups, it can be noticed that the causes of stress are similar, they are always associated with an overwhelming number of duties or with the fact that there are situations that are difficult to overcome. Stress is also one of the factors of progressive burnout. A significant part of the respondents declared that they started working out of a desire to help and change, and had dreamed about this job for a long time. Such people, full of noble ideas, often see a lack of progress and cooperation, they begin to feel stress, which unfortunately leads to burnout. A worrying symptom, however, is the willingness to seek help from friends or family rather than from a specialist. Unfortunately, family and friends are not always able to be good advisers on professional problems, while a qualified specialist is able to work out ways to deal with stress and help in difficult times.

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