Journal of Health Study and Medicine

2019, nr 2

Redaktor naczelny / Editor in chief
dr n. med. Joanna Sułkowska

Skład / Adjustment, Typesetting
Witold Kowalczyk

ISSN 2451-1471

ul. Kilińskiego 109
90-011 Łódź
tel./fax: (042) 676 25 29 wew. 339
e-mail: wydawnictwo@spoleczna.pl

Wersja elektroniczna publikacji jest wersją podstawową, dostępną na stronie:
jhsm.san.edu.pl
E-version is the original version of the article, available:
jhsm.san.edu.pl

Artykuły recenzowane / All the articles published are subject to reviews.

Journal of Health Study and Medicine
2019, nr 2
ss. 5-26
DOI 10.36145/JHSM.2019.09

The Use of CBCT Projection for the Schneider Membrane Thickness Analysis

Bartłomiej Iwańczyk[1]
https://orcid.org/0000-0002-9684-0308

Marcin Adamiec[2]
https://orcid.org/0000-0002-3201-0276

Ewa Izabela Woszczyk[3]

Joanna Trzcinka[3]

Zuzanna Ewa Sokołowska[3]

Jacek Michał Nowak[2]
https://orcid.org/0000-0002-4117-2920

Andrzej Wojtowicz[2]
https://orcid.org/0000-0001-9423-2459

[1] The Chair and Department of Oral Surgery, Medical University of Lublin, Lublin, Poland
[2] Department of Dental Surgery, Medical University of Warsaw, Warsaw, Poland
[3] Student Scientific Circle at the Department of Dental Surgery, Medical University of Warsaw, Warsaw, Poland

Address for correspondence

Bartłomiej Iwańczyk
The Chair and Department of Oral Surgery
Medical University of Lublin, 7 Karmelicka Str.
20-081 Lublin, Poland

Abstract

Introduction: *Maxillary sinus is lined with respiratory region mucosa pseudostratified, ciliated epithelium. The Schneider membrane thickness is an important information in diagnosing pathological conditions and planning surgical procedures, e.g. lifting the maxillary sinus floor. To evaluate the condition of paranasal sinuses the radiological diagnosis is used. More and more frequently dental cone beam computed tomography (CBCT) is used.*

Objectives: *The purpose of this investigation was to determine the medium range of the thickness of membrane in patients that frequently attended medical appointments in the Department of Oral Surgery of the Medical University of Warsaw, having undergone the CBCT procedure, and to determine the boundaries of physiological and pathological condition.*

Material and methods: *The analysis of 150 patients CBCT results was performed and 146 patients were qualified to the examination. The medical history was analyzed with particular attention to the symptom characteristic for diseases of paranasal sinuses. The literature of the researchers reviewing the thickness of the sinus mucosa was reviewed and compared with our own results.*

Results: *The average thickness of maxillary sinus mucous membrane in the examined group of patients is 7.8 mm, with 6.83 mm in patients with no symptom of sinus inflammation, and 9.46 mm in patients with at least one symptom. Moreover, the patients with diagnosed recent, recurring or present sinus inflammation, polyps, tonsillar hypertrophy, asthma and Oro-Antral Communication demonstrated a thicker membrane.*

Conclusions: *The literature reports various ranges of physiological thickness of maxillary sinus mucous membrane. Savolainen et al. Defined the pathological thickening as greater than 6 mm, while Phothikhun et al. as exceeding 1 mm. Most often the physiological norm is defined at 2 mm, e.g., Janner et al. In this study the measurements were done, and the results were compared with the*

ones reported in the literature. The majority of examined patients not reporting sinus inflammation the thickness of the maxillary sinus mucous membrane was ≤6 mm. This means that for patients with Schneider membrane thicker than 6 mm the diagnostics should be extended to search for pathologies.

Key words: *cone beam computed tomography, maxillary sinus, mucous membrane, maxillary sinusitis*

Background

Maxillary sinuses (sinus maxillaris) are two twin, pyramid-shaped voids, located in the body of the maxilla.Its walls corresponding to four surfaces of the body of maxilla. In the nasal wall, maxillary hiatus (hiatus maxillaris) that opens into nasal cavity and connects it with maxillary sinus is located. The posterior wall contains alveolar canals and posterior superior alveolar vessels and nerves. The floor is formed by the alveolar process of the maxilla. With a concave shape in the lowest point it corresponds to the roots of the first maxillary molar tooth. The premolar and molar teeth enter with their alveolus top into the sinus floor, whereas the canine alveolar usually heads frontwards. In a case of disappearance of thin osseous cover, teeth roots can come directly in contact with Schneider membrane. Maxillary sinus begins to develop in the fifth month of fetal growth and reaches its maximum size (approx. 24cm^3) at the moment of complete permanent teeth eruption [1]. The sinus has five recesses: frontal recess, superior palatinal recess, inferior palatinal recess, alveolar recess and zygomatic recess [2].

The physiology of maxillary sinuses is closely related to their microanatomy. The mucous lining of the sinus, called Schneider membrane is a pseudostratified, ciliated epithelium. It is the extension of respiratory area of nasal cavity mucous membrane and usually is similar but thinner, paler and containing less glands, goblet cells and cilia [3]. Healthy mucous membrane has thickness of 0.2 to 0.8 mm [4].

The inflammation of maxillary sinus is a disease of the mucous membrane lining with diversified pathophysiology. The following factors can contribute to developing the inflammation: nasal factors, teeth-derived factors, allergic factors, injury-derived factors, blood-derived factors. The inflammation of maxillary sinus is caused primarily by periapical lesions following defective endodontic treatment, complications after dental caries or inflammation of periodontium, complications after extractions such as the Oro-Antral Communication and entrance of the tooth root into the sinus [5].

There are two types of symptoms of the sinonasal inflammation: great and small. To make a diagnosis of paranasal sinuses inflammation it is

necessary to report the presence of at least two symptoms, including at least one great symptom (Tab. 1).

Table 1. Great and small symptoms of sinusitis

GREAT SYMPTOMS	SMALL SYMPTOMS
Nasal congestion	An unpleasant smell from the mouth
Leakage or retention of purulent discharge in the nose or dripping down the back of the throat	Toothache
Pain/pressure on the face	Headache
Impaired smell	Cough
Fever	Pain/fullness/compression of the ear
Swelling/full face	Fatigue

One of the broadly accepted clinical classification of paranasal sinuses inflammations was proposed by Lund et al., dividing those into acute, recurrent acute and chronic inflammations. The classification is based on the time in which the patient suffers from the disease and it includes also pathophysiologic criteria [8].

Schneider membrane thickness is an important information during the diagnosis of pathologic conditions and during scheduling surgical procedures, e.g. lifting the maxillary sinus floor. To evaluate the condition of paranasal sinuses the radiological diagnosis is used – CT (computed tomography) [9] or CBCT (dental cone beam computed tomography) [10,11], diaphanoscopy [12], endoscopy [13] and fluorescent imaging of near-infrared spectroscopy (NIR) [14]. Radiologic images OPG, CBCT and tooth photography made with the right-angle technique contain the information about the quality and the quantity of the tissues, specifically mineralized tissues. The introduction of Hounsfield scale allows to mathematically analyze tissues with low-mineralization level, e.g. bones are classified as IV type (non-mineralized tissue). The scale fluctuates between -1500 and 3000 units [15]. The results reported by Mah et al. proved the possibility of analyzing grayscale tones in CBCT, with the me-

asurement error of only few percents [15]. Nowadays, the gold standard of imaging in the case of nasal and sinuses mucous membrane inflammation is the computed tomography. However, the CBCT method begins to be used with more and more frequency. The examination conducted with this method, with correctly chosen parameters of exposition and correct patient positioning, provides the information about the extent of disease process and allows to diagnose even the smallest changes in the maxillary sinuses. It also exposes the structure of paranasal sinuses in order to reveal distinct parts in the anatomy [16]. Due to smaller exposure to radiation in comparison with spiral tomography, greater accessibility, shorter examination time and lower costs, in this investigation the thickness of membrane of maxillary sinus was analyzed based on CBCT results.

Objectives

The purpose of this investigation was to determine the medium range of the thickness of membrane and possible factors that could affect the Schneider membrane and cause its thickening. Retrospective examination was conducted on the patients that frequently attended medical appointments in the Department of Oral Surgery of the Medical University of Warsaw, and having undergone the CBCT procedure to make a diagnosis. Available references do not state a clear range, nor the borders between the physiology and pathology of the membrane thickness. The cited authors' results oscillate between 1mm to 6mm.

Material and Methods

The analysis of 150 patients of Department of Oral Surgery's CBCT results was conducted. 146 patients were qualified to the examination, 4 persons did not agree to take part in the investigation. Using the i-CAT Vision program, the measuring of the thickness of maxillary sinus mucous membrane was carried out in the CBCT examination in similar conditions. The measured part was located on the level of premolar teeth and first molar teeth on the right and left side. A questionnaire was conducted among the qualified patients, with special emphasis on symptoms of

sinus inflammation: sinus headache symptom, often described as uncomfortable pressure sensation, headache while bending over, mucus dribbling on the throat back wall.

Additionally, factors that could possibly affect the thickness of mucous membrane were investigated: Oro-Antral Communication, operations of paranasal sinuses, earlier diagnosis of pathology in the sinus area (polyps in maxillary sinus), tonsillar hypertrophy, asthma, sex, age, permanent residence location, smoking (Fig. 1).

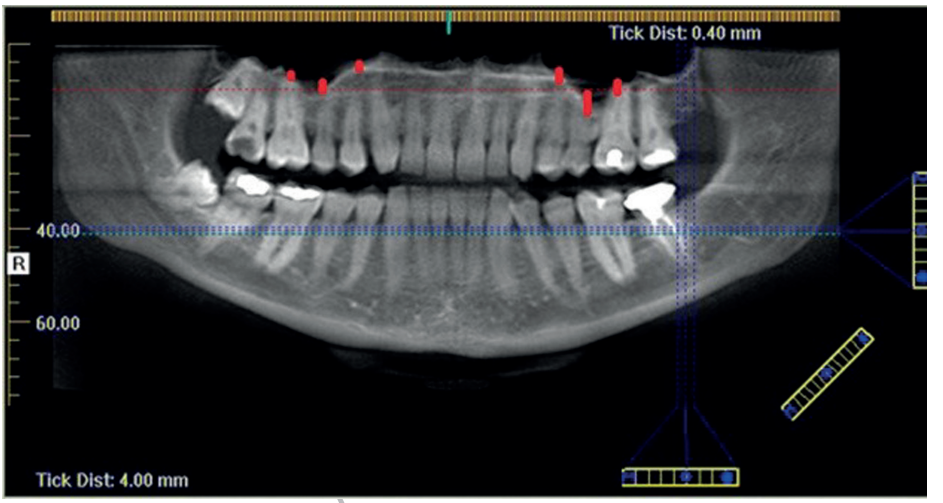


Figure 1 – location of maxillary sinus mucous membrane measurement

Results

As a result of the investigation, two main groups were identified. The first group consisted of patients with no symptom of sinus inflammation. The second group patients with at least one of the symptoms mentioned before.

The average mucous membrane thickness in the examined group of patients is 7.8 mm, with 6.83 mm in the first group and 9.46 mm in the second one.

The median of all the patients – 5.3 mm, patients from the first group – 5.05 mm, patients from the second group – 6.55 mm.

Maximum thickness reported in the first group – 26.2 mm, in the second – 38.9 mm.

Minimum thickness in the first group – 0 mm, in the second group – 1 mm.

In the patients with at least one symptom of sinus inflammation diagnosed, the maxillary sinus mucous membrane was 38.5% thicker compared with patients with no symptoms. Patients who reported sinus headache symptom, often described as uncomfortable pressure sensation, had the membrane thicker by 39.7%, headache while bending over – 33.6%, mucus dribbling on the throat back wall – 13.5% (Tab. 2, Tab. 3, Tab. 4, Tab. 5).

Table 2. Impact of history of sinusitis or presence of at least one symptom of sinusitis on the thickness of maxillary sinus mucosa

Sinusitis or suspicion	Number of respondents	Average thickness of the mucosa
No	92	6.83
Yes	54	9.46
Total	146	7.80

Table 3. Impact of sinusitis symptom in the form of spreading sensation in the face to the thickness of the maxillary sinus mucosa

Feeling of spreading face	Number of respondents	Average mucous membrane thickness
Nie	136	7,59
Yes	10	10,60
Total	146	7,80

Table 4. Impact of sinusitis symptom of headache when bending on the thickness of maxillary sinus mucosa

Headache when bending	Number of respondents	Average thickness of the mucosa
No	118	7.43
Yes, rarely or slight	10	8.32
Yes	18	9.93
Total	146	7.80

Table 5. Impact of the discharge dripping down the back of the throat on the thickness of maxillary sinus mucosa

Discharge dripping down the back of the throat	Number of respondents	Average thickness of the mucosa
No	103	7.50
Yes	43	8.51
Total	146	7.80

Table 6. Impact of past, recurring or present sinusitis on the thickness of maxillary sinus mucosa

Sinusitis past/recurrent/ present	Number of respondents	Average thickness of the mucosa
No	128	7.63
Yes	18	9.01
Total	146	7.80

Both the first and the second group consists of most patients with the membrane thickness of 0 mm to 8 mm (Fig. 2). However, 70% of the patients of the first group demonstrated Schneider membrane thickness no bigger than 6 mm. In the second group of the patients in almost 50% the thickness was more than 6 mm (Fig. 3).

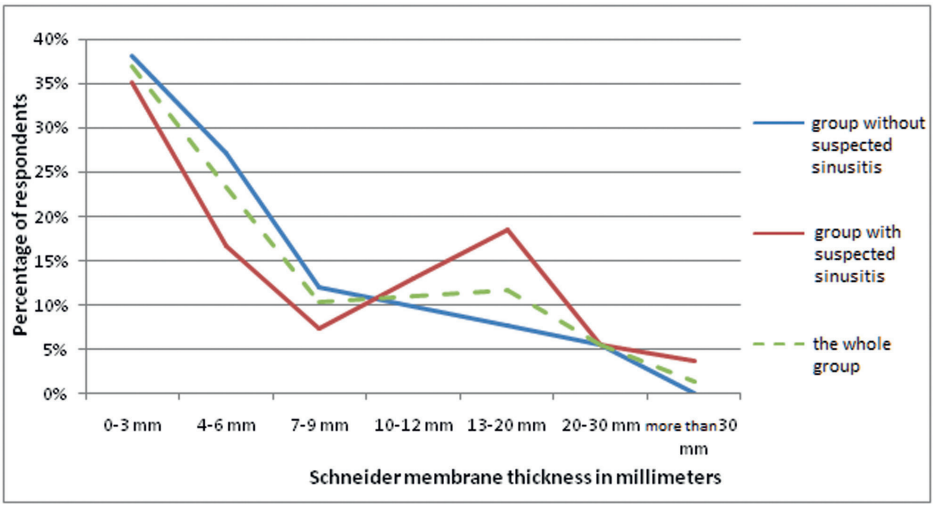


Figure 2. Percentage of the study group presenting a given thickness of Schneider's membrane

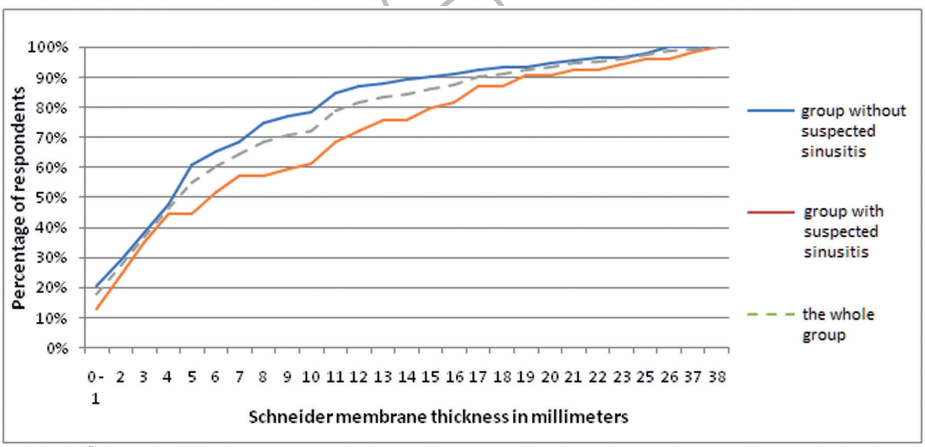


Figure 3. Percentage of patients with Schneider membrane thickness equal or smaller than the given value

The patients with diagnosis of recent, recurring or present sinus inflammation demonstrated the membrane thicker by approx. 1.4 mm on average compared with patients with no inflammation recorded (Tab. 6).

The patients with complications after extraction in form of Oro-Antral Communication demonstrated the membrane thicker by 4.1 mm on average than patients with no complications (Tab. 7).

Table 7. Impact of the complications after extractions in the form of oro-antral communication on the thickness of maxillary sinus mucosa

Complex extractions, oro-antral communication	Number of respondents	Average thickness of the mucosa
No	135	7.49
Yes	11	11.58
Total	146	7.80

The patients with polyps in maxillary sinus demonstrated the membrane thicker by 5.3 mm compared with patients with no polyps diagnosed (Tab. 8).

Table 8. Impact of polyps in the maxillary sinus on the thickness of maxillary sinus mucosa

Polyp	Number of respondents	Average thickness of the mucosa
No	141	7.62
Yes	5	12.88
Total	146	7.80

The examination reports also show that people with tonsillar hypertrophy demonstrated the membrane thicker by 45.6% compared with people with no hypertrophy (Tab. 9).

Table 9. Impact of tonsil hypertrophy on the thickness of maxillary sinus mucosa

Tonsil hypertrophy	Number of respondents	Average thickness of the mucosa
No	126	7,58
Deleted	11	7,64
Yes	9	11,04
Total	146	7,80

Patients with asthma had the Schneider membrane thicker by 1.3 mm than people without this disease (Tab. 10).

Table 10. Impact of asthma on the thickness of maxillary sinus mucosa

Asthma	Number of respondents	Average thickness of the mucosa
No	134	7.69
Yes	12	8.99
Total	146	7.80

Polyp	Number of respondents	Average thickness of the mucosa
No	141	7.62
Yes	5	12.88
Total	146	7.80

The investigation showed no significant correlation between sex and smoking and the Schneider membrane thickness.

The patients from the first group did not demonstrate connection between the thickness and the sex of the patient. In the second group, men had the membrane thicker by 2.41 mm on average (Tab. 11).

Table 11. Impact of gender on the thickness of maxillary sinus mucosa

	Number of respondents		Average mucous membrane thickness
F	All respondents	89	7,29
M		57	8,59
Total amount		**146**	**7,80**
F	Group 1	54	5,83
M		38	8,24
Total amount		**92**	**6,83**
F	Group 2	35	9,54
M		19	9,30
Total amount		**54**	**9,46**

Smokers demonstrated slightly thinner membrane than non-smokers (Tab. 12).

Table 12. Impact of smoking on the thickness of maxillary sinus mucosa

Cigarettes	Number of respondents	Average thickness of the mucosa
No	108	7.86
Yes	38	7.63
Total	146	7.80

The research included also investigating the impact of permanent residence location on the thickness of the Schneider membrane, taking into consideration the population of the town or city. However, in the group of 146 patients, 113 persons lived in Warsaw. This issue is continuously investigated, taking into account more diversified patient groups, including residents from towns of various localization, infrastructure development level and air contamination level.

The biggest medium thickness of alveolar bone mucous membrane was recorded in age groups of 25-30 and 65-70 years. In order to confirm these results, the research should be widened by adding the same number of persons to each age group (Fig. 4).

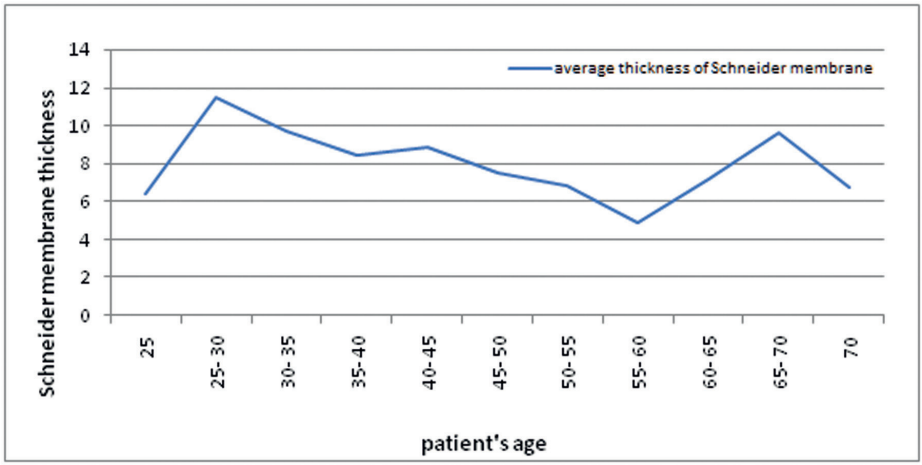


Figure 4. Average Schneider membrane thickness in various age groups.

Discussion

The literature reports various ranges of physiological thickness of the maxillary sinus mucous membrane thickness, from 1 mm to 6 mm: Savolainen et al. defined pathological thickness as greater than 6 mm [17]. Vallo affirms that physiological Schneider wall thickness should measure from 3 mm to 6 mm [18]. Phothikhun et al. stated that pathological thickening is greater than 1 mm [19], so did White [20]. Other authors, such as Janner et al. [21] and Rak KM [22] define the limit of physiological thickness of mucous membrane at approx. 2 mm.

For the majority of patients who took part in the examination and did not report any symptoms of sinus inflammation, the average thickness of maxillary sinus mucous membrane was equal or smaller than 6 mm. This result corresponds to Savolainen et al. observations published in *Radiological findings in the maxillary sinuses of symptomless young men* [17]. It means that patients who report the Schneider membrane thickness greater than 6 mm should be examined in search for pathological changes.

In addition, greater thickness of Schneider membrane was noted in patients who reported symptoms or undergoing sinus inflammation and

alsotonsillar hypertrophy, polyps in the maxillary sinus, asthma and Oro--Antral Communication.

According to Kryst, the definition of sinus inflammation includes a group of medical conditions which all have one feature in common: the presence of inflammatory process in sinonasal mucous membrane [2]. This research showed that patients with diagnosed sinus inflammation (recent, past, present or recurring), demonstrated maxillary sinus mucous membrane thicker by approx. 1.4 mm on average than healthy patients. Also Hryniewicz points out that, proven in a radiologic examination, sinonasal mucous membrane thickening allows to diagnose acute sinonasal inflammation. Responsivity of this method equals 76% [6].

This investigation confirms that patients who had reported tonsillar hypertrophy, demonstrated Schneider membrane thicker by 3.5 mm on average. This fact has its explanation described in the research by Hryniewicz, who states that throat adenoid hypertrophy is a factor that increases the possibility of suffering from development and recurrence of sinus inflammation [6]. In this investigation, the patients with the presence of polyps in maxillary sinus had Schneider membrane thicker by 5.3 mm compared with patients without polyps. According to Maria Zaleska--Krecicka, polyps develop from inflammatory or allergic changes of mucous membrane. The most common localizations of polyps are maxillary sinuses, ethmoid sinuses and middle nasal cavity. The polyp derives from mucous membrane edema, then proliferation of submucosa and cumulation of liquids [23]. Fokkens et al. in his publication confirms that chronic rhinosinusitis with nasal polyps is described as a subgroup of chronic rhinosinusitis. What is more, chronic rhinosinusitis, with or without polyps, are commonly treated as one disease type, as they are almost impossible to distinguish [24]. In our investigation, 5 patients of 146 were diagnosed with polyps, which is approx. 3.5% of patients. It confirms the observation of Fokkens et al., who stated that polyps affect 4% of population. Furthermore, he described the correlation between polyp presence, chronic nasal and sinonasal mucous membrane inflammation, acute bronchial asthma and aspirin intolerance, called “Samter’s triad”, aspirin-induced asthma or

Samter's syndrome. Fokkens points out that 7-15% of asthmatics suffer from nasal polyps. In this investigation, in the group of 12 asthmatics, polyps were diagnosed in 2 persons, which makes 16,7%.

This investigation proved that asthmatics demonstrate thicker Schneider membrane, what is confirmed in Satoshi Hamada et al. observations, described in the article *Radiographic Evidence of Sinonasal Inflammation in Asthma-chronic Obstructive Pulmonary Disease Overlap Syndrome: an Underrecognized*. Satoshi Hamada proved that the frequency of presence of radiologic symptoms of sinus inflammation among people with asthma, ACO and COPD equaled respectively 95.5%, 72.2% and 60%. Patients suffering from ACO and COPD were diagnosed with mild radiologic symptoms, while average to severe symptoms were reported in the cases of people with asthma [25]. E. J. Peters et al. in his research *Sinus computed tomography scan and markers of inflammation in vocal cord dysfunction and asthma* proved the correlation between asthma and sinus disorders in 1/3 of patients [26]. Also M. Bresciani et al. in the publication Rhinosinusitis in severe asthma [27] presented a connection between chronic sinus inflammation and asthma.

This investigation did not prove a direct correlation between smoking and maxillary sinus mucous membrane thickening. However, the publication Microbiology of acute and chronic maxillary sinusitis in smokers and nonsmokers [28] proved that the amount of bacteria causing chronic mucous membrane inflammation and smoking are related. Smokers demonstrated a much higher number of those pathogens. Smoking can directly affect the thickness of maxillary sinus mucous membrane. It is also important to point out that smoking can worsen the condition of people with asthma, what in consequence can lead to thickening of sinus mucous membrane [29].

In order to confirm the relation between sex and mucous membrane thickness it would be necessary to research a wider group of patients. In this investigation, the group of not healthy patients did not demonstrate any connection between Schneider membrane thickness and sex, whereas in the group of healthy patients men showed a thicker membrane

by 2.41 mm on average. This fact can also be noted in the publication by Vogiatzi T et al., *Incidence of anatomical variations and disease of the maxillary sinuses as identified by cone beam computed tomography; a systematic review*, where one of the conclusions is that men usually demonstrate higher frequency of pathological changes in maxillary sinus, including the thicker mucous membrane [30].

The research on the impact of air contamination on Schneider membrane thickness is being carried out currently (Fig. 5).

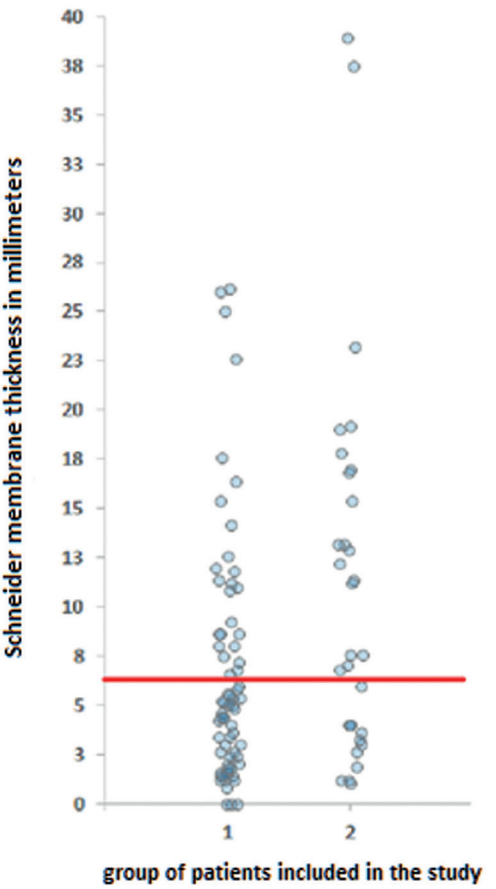


Figure 5. Schneider membrane thickness and suspicion of sinus inflammation

References

1. Bochenek A, Reicher M. Anatomia człowieka. Vol 1. 13TH ed. Warszawa: Wydawnictwo Lekarskie PZWL; 2010. pp. 364-367.

2. Marszał K. Znaczenie wybranych szczegółów anatomicznych zatok szczękowych w planowaniu leczenia stomatologicznego – przegląd piśmiennictwa. Dental Forum 2013; XXXXI: 69.

3. Bochenek A, Reicher M. Anatomia człowieka. Vol 5. 6TH ed. Warszawa: Wydawnictwo Lekarskie PZWL; 2010. p. 378.

4. Qianqian F, Lin C, Sheng X, Xjaopeng H, Zhonghao L. Obserwacja zmian grubości błony śluzowej po uniesieniu dna zatoki szczękowej i jednoczesnej implantacji. ChungHuaKouChiangHsuehTsaChih 2015; 50(9): 531-535.

5. Krysztopik J, Dudzińska-Filkiewicz A. Jatrogenne zapalenie zatok szczękowych. Stomatologia praktyczna 2016; 6: 74-76.

6. Hryniewicz W, Grzesiowski P, Kosielski J. Rekomendacje diagnostyki i leczenia układu oddechowego. 2ND ed. Warszawa: Narodowy Instytut Leków; 2016. pp. 83-85.

7. Krzeski A, Szwedowicz P. Zapalenie zatok przynosowych: klasyfikacja i definicje. Magazyn otolaryngologiczny 2006; 9: 7.

8. Lund VJ, Kennedy D. Staging for Rhinosinusitis. Otolaryngology Head Surg 1997; 117 (Suppl.): 35-40.

9. Bulbul E, Yanik B, Demirpolat G. Detection of Dental Pathologies in Routine Paranasal CT Scans: A Retrospective Study. J Clin Diagn Res 2017 Jul; 11(7): TC17-TC20.

10. Talo Yildirim T, Güncü GN, Colak M, Nares S, Tözüm TF. Evaluation of maxillary sinus septa: a retrospective clinical study with cone beam computerized tomography (CBCT). Eur Rev Med Pharmacol Sci 2017 Dec; 21(23): 5306-5314.

11. Shcherbakov DA, Kryukov AI, Krasnozhen VN, Hukumatshoev AI, Karimova AI. Certain morphometric characteristics of the normal maxillary sinus. Vestn Otorinolaringol 2017; 82(4): 44-47.

12. Kierzek A. Diaphanoscopy (transillumination) of maxillary sinuses: a method too early forgotten? Otolaryngol Pol 1995; 49(4): 371-379.

13. Dewey A, Christmas, MD, Joseph P, Mirante, MD, MBA, FACS, Eiji Yanagisawa, MD, FACS. Endoscopic view of an acutely inflamed maxillary sinus. Ear Nose Throat J 2017 Dec; 96(12): E47.

14. Coughlan CA, Cerussi AE, Kim J, Ison S, Bhandarkar ND. Near-Infrared Optical Imaging for Diagnosis of Maxillary Sinusitis. Otolaryngol Head Neck Surg 2016 Sep; 155(3): 538-541.

15. Mah P, Reeves TE, McDavid WD. Deriving Hounsfield units using grey levels in cone beam computed tomography. Dentomaxillofac Radiol 2010 Sep; 39(6): 323-335.

16. Kijak E, Lietz-Kijak D, Frączak B, Wilk G. Przypadkowe wykrywanie zmian chorobowych zatok obocznych nosa w badaniu tomografii wolumetrycznej w przebiegu diagnostyki różnicowej dysfunkcji stawów skroniowo – żuchwowych. Stomatologia praktyczna 2015; 5: 75.

17. Savolainen S, Eskelin M, Jousimies-Somer H, Ylikoski J. Radiological findings in the maxillary sinuses of symptomless young men. Acta Otolaryngol Suppl 1997; 529: 153-157.

18. Vallo J, Suominen-Taipale L, Huumonen S, Soikkonen K, Norblad A. Prevalence of mucosal abnormalities of the maxillary sinus and their relationship to dental disease in panoramic radiography: Results from the health 2000 health examination survey. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2010; 109: E80-E87.

19. Phothikhun S, Suphanantachat S, Chuenchompoonut V, Nisapakultorn K. Cone-beam computed tomographic evidence of the association between periodontal bone loss and mucosal thickening of the maxillary sinus. J Periodontol 2012; 83: 557-564.

20. Janner SF, Caversaccio MD, Dubach P, Sendi P, Buser D, Bornstein MM. Characteristics and dimensions of the Schneiderian membrane: A radiographic analysis using cone beam computed tomography in patients referred for dental implant surgery in the posterior maxilla. Clin Oral Implants Res 2011; 22: 1446-1453.

21. Rak KM, Newell JD, Yakes WF, Damiano MA, Luethke JM. Paranasal sinuses on MR images of the brain: significance of mucosal thickening. AJR 1991; 156: 381-384.

22. Newton JR, Ah-See KW. A review of nasalpolyposis. Therapeutics and ClinicalRisk Management 2008; 4(2): 507-512.

23. Fokkens W, Lund V, Mulld J et al. European position paper on rhinosinusitis and nasal polyps. Rhinol 2012; 50(23): 1-136.

24. Hamada S, Tatsumi S, Kobayashi Y, Matsumoto H, Yasuba H. Radiographic Evidence of Sinonasal Inflammation in Asthma-Chronic Obstructive Pulmonary Disease Overlap Syndrome: An Underrecognized Association. The Journal of Allergy and Clinical Immunology: In Practice; available online 29.04.2017.

25. Peters EJ, Hatley TK, Crater SE, Phillips CD, Platts-Mills TA, BorishSinus L. Sinus computed tomography scan and markers of inflammation in vocal cord dysfunction and asthma. Ann Allergy Asthma Immunol 2003; 90: 316-322.

26. Bresciani M, Paradis L, Des Roches A, Vernhet H, Vachier I, Godard P et al. Rhinosinusitis in severe asthma. J Allergy Clin Immunol 2001; 107: 73-80.

27. Brook I, Hausfeld JN. Microbiology of acute and chronic maxillary sinusitis in smokers and nonsmokers. Ann Otol Rhinol Laryngol 2011; 120(11): 707-712.

28. Vogiatzi T, Kloukos D, Scarfe WC, Bornstein MM. Incidence of anatomical variations and disease of the maxillary sinuses as identified by cone beam computed tomography: a systematic review. Int J Oral Maxillofac Implants 2014; 29(6): 1301-14.

Journal of Health Study and Medicine
2019, nr 2
ss. 27-52
DOI 10.36145/JHSM.2019.10

Study of the Influence of the Plantar Aponeurosis Mobilization on the Reduction of the Superficial Back Line Tension at the Competitors Training for Obstacle Runs

Kamil Pawicki[1]

Ireneusz Jurczak[2]

https://orcid.org/0000-0001-6169-8690

[1] Centrum Almed, Lodz, Poland

[2] Institute of Health Sciences, University of Social Sciences, Lodz, Poland

Address for correspondence

Kamil Pawicki
Centrum Almed, 228 Kilinskiego Str.
93-124 Lodz, Poland
e-mail: kamil050195@wp.pl

Abstract

Introduction: *Running is one of the most frequently chosen forms of physical activity. The participants taking the specially constructed routes deal with not only the distance, but also many obstacles ranging from natural difficulties in the form of terrain and swamps, to artificially created balancing pits, ditches, fences, etc. [3]. The Obstacle Course Racing runs, in nature demanding in terms of physical condition for the athlete, must be preceded by proper preparation. Its lack in all running disciplines entail the risk of injuries, most common of which are plantar aponeurosis overstrain and injuries of other structures of posterior fascia chain.*

Purpose: *The purpose of this study was to investigate the impact of the plantar aponeurosis mobilisation on the tension of the entire superficial back line in people actively preparing for starts in obstacle runs.*

Material and methods: *A group of 40 people including 17 women and 23 men took part in the study. All study participants were in the 20-30 age range and trained regularly at least twice a week for at least six months preparing for the OCR competition. All study participants underwent three sessions of 10-minute plantar aponeurosis mobilisation, based mainly on deep tissue massage techniques and using fascia tools (Fazer). To assess the effect of the procedure, the subjects were tested both before and immediately after the mobilisation was completed, and the Thomayer test was chosen as the measurement method. All analyses were performed in the Statistica v.12 package. A significance level of 0.05 was used for all analyses.*

Results: *Analysis of the results in Table 3 gave grounds to establish significant differences between the mean results before and after $p<0.01$ for each of the three mobilisations. Significant differences were also found among the results before the first mobilisation and the results after the second mobilisation ($p=0.001$) and the third mobilisation ($p=0.0001$), and between the results before the first mobilisation and before the third mobilisation ($p=0.011$).*

Analysis of the results gave grounds to conclude that the average effect of the procedure during the first mobilisation was statistically significantly stronger than in the case of the second and third mobilisation. There were no significant differences between the average effect of the second and third mobilisation p>0.05.

Conclusions: *Mobilisation of plantar aponeurosis has an impact on the tension of the posterior anatomical chain in people training for obstacle runs. The average effect of the procedure during the first mobilisation is statistically significantly stronger than in the case of the second and the third mobilisation. The improvement in the range of motion of the spine flexion resulting from subsequent mobilisations tends to persist.*

Introduction

Running is one of the most frequently chosen forms of physical activity. The research shows that about 20% of physically active Poles declare training this sport regularly [1]. In the recent years the extreme OCR (Obstacle Course Racing) runs, commonly called runmagedons, are becoming particularly popular among enthusiasts of extreme experiences [2]. The participants taking the specially constructed routes deal with not only the distance, but also many obstacles ranging from natural difficulties in the form of terrain and swamps, to artificially created balancing pits, ditches, fences, etc. [3]. The OCR runs, in nature demanding in terms of physical condition for the athlete, must be preceded by proper preparation. Its lack in all running disciplines entail the risk of injuries, most common of which are plantar aponeurosis overstrain and injuries of other structures of posterior fascia chain [4].

Anatomy

Plantar aponeurosis is a structure that is a part of the deep fascia in the bottom part of the foot. In terms of biomechanics, it is a vital element providing connection between calcaneus and toes. This fascia starts at the calcaneus, from where it goes distally forming a number of slips running towards the plantar side of the forefoot, penetrating into both the lateral and medial intermuscular septum. Anatomically, the plantar aponeurosis can be divided into three slips: lateral, medial and central. While the lateral and medial slips have different character, the central one is the main element of plantar aponeurosis both functionally and structurally and in some sources is called the proper plantar fascia. The central slip in the middle of the sole length splits into five slips, each of which is attached to the tendon sheaths of the flexor muscles of the toes and joint capsules of the corresponding metatarsophalangeal joints. Some structurally weaker fibres run under the metatarsal bones heads and are attached to the skin tissue. The different character of the lateral and medial slips consists in transforming their initial tendon structure in the fascia of the flexor muscles of the fifth toe and big toe, respectively.

Biomechanics of the plantar aponeurosis and foot arch

The whole foot arch needs to be seen as an architectonic complex of anatomic structures, which the bones, joints, muscles, tendons and fascia are. They can be seen as the equivalent of palmar cavity, which, over the course of evolution managed to adjust perfectly to serve its new function resulting from bipedal locomotion, i.e. the optimal transfer of body weight towards the ground [7]. To understand better the biomechanics of the foot arch and the role of plantar aponeurosis in its architecture, it is necessary to briefly discus these relations. In general, the plantar arch consists of three arches arranged on the plan of an equilateral triangle, whose vertices are the individual points of support of the foot.

These points correspond respectively to the head of the first metatarsal bone, the head of the fifth metatarsal bone and lateral processes and the medial tuberosity of calcaneus. The support points are connected with each other by arches of the foot. The transversal arch is the shortest and the least arched, the lateral arch, in turn, has an intermediate height, while the medial one is the longest and at the same time the highest, and it performs the most important function in terms of biomechanics in both static and dynamic conditions [8,9].

Plantar aponeurosis plays very important role in transferring mechanical tension within the foot. Its main function is to support the longitudinal arches of the foot, mainly the medial arch [10]. In the free-standing position, these arches can be compared to a frame, in which the plantar fascia acts as a flexible element connecting both compressed elements. When the joints are subjected to body weight and the internal rotation of the tibia, the elongation of this arch is limited by the tension generated within the fascial structures [11]. The longitudinal bundle of plantar aponeurosis fibers makes it an important, passive element of stiffening the entire arch [12]. Studies have shown that cutting the plantar fascia resulted in a 25% reduction in its stiffness [13].

Mechanism of foot amortisation during locomotion

Both during walking and running there are alternately repetitive movements in the foot. The mechanisms in the foot are designed to cushion our steps. What definitely has to be taken into account in terms of this paper is the occurrence of foot inversion and eversion in each of these cycles. Shortly before touching the ground the foot performs the inversion movement, which consists in inversion, adduction and plantar flexion of the foot. As a result of this movement, the outer part of the heel is the first to contact the ground. Immediately after contact, the foot flattens because of further contact of its entire surface with the ground and a descending change in the position of the lower ankle, which at the end of the transfer phase sets in eversion. As a result of this movement, the plantar fascia tightens and supports eccentric muscle work supporting the arch of the foot. Along with the gradual transfer of body weight towards the forefoot and the transition to the rebound phase, inversion occurs again and the entire foot work cycle repeats [14]. When the weight is transferred onto the toes, their dorsal flex results in a strained plantar aponeurosis, which results in increased plantar flexion corresponding to individual metatarsal bones, and thus raising the longitudinal arch of the foot. This effect is described in literature as the Windlass Mechanism (Fig. 1) [15].

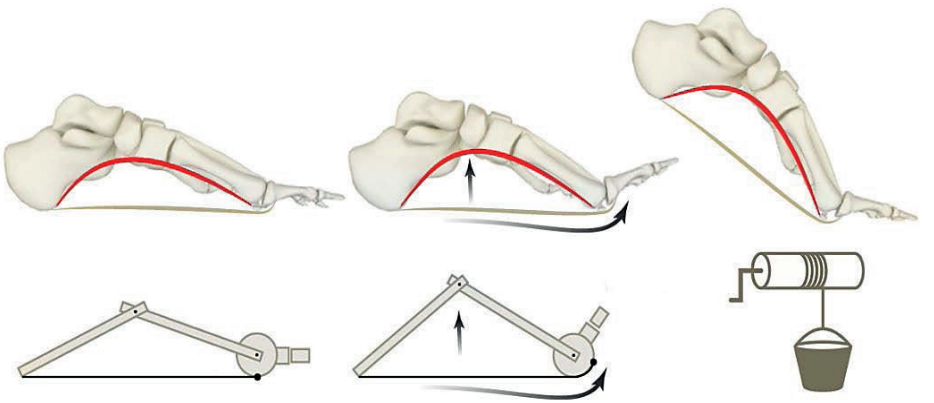


Figure 1. Model showing the operation of the Windlass Mechanism [15]

What definitely distinguishes the run cycle from the walk cycle is the occurrence of the flight phase. It results in the increased vertical movements of the body, and thus greater speed and strength when the foot touches the ground. Speed determining the load increase (Fig. 2) is definitely higher here and reaches its maximum after about 0.05 s, while for walk it reaches the value of 0.15 s. This fact along with the absence of double support phase means that the body weight is absorbed by one limb, and tissues are under more rapid and greater tensions. The vertical forces affecting the body during a run are directly related to the body weight. Usually, during the run the vertical forces of reaction of the ground assume values about 2.0-2.5 of body weight. As the running speed increases, the maximum force with which the foot hits the ground increases, and thus increases the speed of load increase, which is also supported by the decreasing time of contact of the foot with the ground.

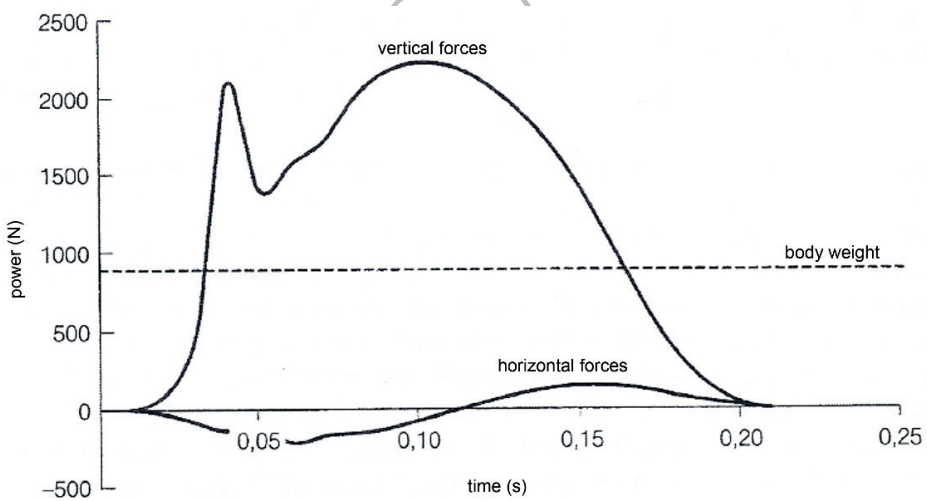


Figure 2. Distribution of vertical and horizontal forces during a run [16]

During both walk and run the body rises and falls as well as accelerates and slows down, which causes changes in potential and kinetic ener-

gy. Both change in mutually compatible phases, namely when the kinetic energy reaches a high value, the potential shows a significant increase in value, too. Achieving their maximum during running is facilitated by the mechanism of energy storage in tissues, e.g. Achilles tendon or fascial tissue, and then giving it away as elastic energy. Due to this phenomenon, the absorbed energy reduces the energy expenditure of muscles working actively in the rebound phase, further contributing to a significant increase in body acceleration [16, 17].

Characteristics of muscular fascial tissue

In very general way, fascia can be characterised as a kind of connective tissue ubiquitous in human body. It is a kind of „packaging" for all somatic structures of our body limiting their direct contact and enabling moving along each other by keeping them in the spatial network it creates. From the morphological perspective fascia consists mostly of various kinds of collagen fibres of varying thickness and spatial distribution conditioned by the type of function performed, as well as elastin fibres. Depending on the authors, the systematic division of the fascia usually involves several layers of this tissue. In the simplest way it can be divided into three basic groups: superficial, deep and muscular fascia. The superficial fascia includes subcutaneous connective tissue with irregular weaving, rich in numerous fat cells as well as cutaneous blood vessels and nerve fibres. This layer provides free movement of the skin in relation to deeper structures including deep fascia. Deep fascia is a layer built with compact connective tissue which surrounds all muscles and organs. It lacks the adipose tissue and the course of its fibres takes on a transverse, spiral or longitudinal orientation depending on the direction of the tensions it transfers. It creates intermuscular septa as well as tendon sheaths for nerves and vessels. The muscle fascia structure is compared to a three-dimensional matrix system that continuously runs over each of the muscle components, joining them into one functional whole. It builds respectively: epimysium, perimysium and endomysium. The epimysium layer surrounding each of the muscles transforms into a tendon and thus provides a connection be-

tween the muscular belly and bone tissue. The perimysium separates the bunches of individual muscle bundles. It stays, though, in close contact with tendon and epimysium, thus creating a uniform mechanical connection. The last of the listed layers is tissue surrounding each individual muscle fibres and ensuring their mutual integration, i.e. endomysium.

To sum up, muscular fascia is the tissue providing proper functioning of each muscle. By providing a network of connections between all its components, it plays an important role in regulating muscle tone, transmitting the strength of its contraction as well as preventing excessive stretching [18].

The fascial tissue has a high ability to regulate the tension in the myofascial system. Understanding fascial neurodynamics is the key to explaining the effectiveness of mobilisation techniques used in this work. The discussed function is possible due to the presence of numerous mechanoreceptors ensuring close integration of connective tissue with the nervous system [19].

Research clearly indicates that the fascia mainly consists of four types of nerve endings strongly sensitive to mechanical stimuli, which include:

- Golgi's tendon organs
- Pacinian lamellar bodies
- bulbous corpuscle
- interstitial receptors

A large part of them performs the function of chemo and thermoreceptors, however, according to current research, the largest percentage are mechanoreceptors. Due to the character of received stimuli, low- and high-pressure threshold fibres are distinguished here. Stimulation of the proper type depends on the intensity of the stimulus. Interstitial receptors interact closely with the autonomic nervous system, resulting in, among other things, change in blood pressure. The literature shows that they are responsible for tuning the UN responsible for regulating blood flow in tissues [20].

Basing on the conducted research, it can be clearly stated that all soft tissue mobilisation techniques affect their mechanoreceptors giving

the effect, among other things, of change in the tension of myofascial structures. Stimulation of mechanoreceptors has a strong impact on the gamma-system of innervation in particular, whose centres located in the brain stem are mainly responsible for less conscious control of anti-gravity muscle tone. Those muscles regulate body posture and take part in programming the movement patterns. The possibility of regulating their activity through gamma motoneurons allows correction of functional disorders. This fact is the evidence of the effectiveness of manual techniques and the legitimacy of their use in therapy. Awareness of the existence of various types of mechanoreceptors and the effects of their activation allows to achieve the intended therapeutic effect, thanks to adequately adapted stimuli [21].

Superficial Back Line

One of the anatomic chains described by Myers is The Superficial Back lLne. Its elements include the following structures:

- plantar fascia, short flexors digitorum muscles
- Achilles tendon, gastrocnemius musles
- sciatic and shin muscles
- sacro-tuberous ligament
- sacro-lumbar fascia and dorsal extensor muscle
- epicranial aponeurosis

The function of the discussed chain is maintaining the erect posture of the body and preventing its forward leaning (postural function). Strong myofascial structures effectively regulate the extension and flexion of the entire body in the fibular plane. The muscles that make it up are made up largely of slow-twitch fibres, characterised by considerable strength. In turn, tension disorders in its course may be the reason for such pathological situations as: limitation of dorsiflexion in the ankle joint, contracture of the Achilles tendon and muscles of the sciatic-shin group, excessive pelvic tilt, or limitation of the flexion of the spine. From a therapeutic point of view, the fact that the tensions generated in any of the section of a given chain are transferred to its other elements causes that the

restriction in one of them can be the reason for restrictions even in the most distant ones [22, 23].

Biomechanical model of the human body based on myofascial tapes is a scientifically proven fact. Many specialists from the world of physiotherapy and orthopaedics prove the validity of this theory and see in it the key to understanding the mechanism of many functional disorders of the musculoskeletal system. Plantar aponeurosis as a structure of the superficial back line is the first of many links in its entire chain. People who run regularly often put heavy loads on them due to the nature of the chosen sport.

The purpose of this study was to investigate the impact of the plantar aponeurosis mobilisation on the tension of the entire superficial back line in people actively preparing for starts in obstacle runs.

Material and methods

A group of 40 people including 17 women and 23 men took part in the study. All study participants were in the 20-30 age range and trained regularly at least twice a week for at least six months preparing for the OCR competition. Standard training units consisted of, among other things, endurance and functional training based on Crossfit.

All study participants underwent three sessions of 10-minute plantar aponeurosis mobilisation, based mainly on deep tissue massage techniques and using fascia tools (Fazer) (Fig. 3-6). The break between consecutive sessions was 2 days, during which the subjects led a normal lifestyle, regularly participating in standard trainings. To assess the effect of the procedure, the subjects were tested, both before and immediately after the mobilisation was completed, and the Thomayer test was chosen as the measurement method. According to the methodology, each participant was asked to stand with the lower limbs joined and let the torso fall forward with the upper limbs lowered freely, while ensuring full extension in the knee joints. After performing the above operation, using a tailor centimetre, the distance from the tip of the middle finger of the right hand to the floor surface was measured.

Figure 3. Mobilization of plantar aponeurosis with Fazer

Source: own.

Figure 4. Mobilization of plantar aponeurosis with the fist and heads of metacarpal bones

Source: own.

Figure 5. Mobilization of the lateral and medial plantar aponeurosis

Source: own.

Figure 6. Mobilization of plantar aponeurosis with heads of the proximal phalanges

Source: own.

Quantitative features were evaluated in the study. The analysis of such data has its own specificity, which consists of using adequate statistical tools for comparisons. In order to characterise the structure of the studied variables, basic descriptive statistics were calculated in the form of measures of location, variability, asymmetry and concentration. To verify the significance of the differences in the before-after results and between mobilisations, analysis of variance with repeated measurements was used, to verify the significance of differences for the created variable that is the effect, i.e. the difference in the result before and after, in each mobiliation one-way analysis of variance was used. A significance level of 0.05 was used for all analyses. All analyses were performed in the Statistica v.12 package.

Results

Analysis of the results contained in Table 1 gave grounds for stating large heterogeneity of the results of the analysed variables, coefficients of variation V>20%. Asymmetry results – skewness allow the conclusion that all distributions are moderately asymmetrical, right-sided results are in the range of <-1, 1>. The concentration of individual cases around the average is very close to the concentration in the normal distribution. Kurtosis results are in the range of <-2, 2>. The next analyses concerned the verification of the significance of differences between individual measurements and mobilisations.

The analysis of the results included in Table 2 gave grounds to reject the null hypothesis about the lack of differences and to accept an alternative one stating that at least between the two average values there were statistically significant differences p <0.001. The analysis of variance does not indicate, however, between which interactions there were significant differences. To figure that out, in the subsequent analyses the Tuckey's post-hoc multiple comparisons tests were carried out for equal multiplicities.

Table 1. Descriptive statistics of results obtained in the Thomayer test

Mobilisation		Average	Median	S (standard deviation)	V (coefficient of variation)	Slant	Kurtosis
I	before	4.60	4.00	3.51	76.37	0.66	-0.33
	after	3.10	2.00	3.10	99.97	0.84	-0.26
II	before	4.33	3.00	3.52	81.35	0.70	-0.29
	after	3.13	2.00	3.02	96.73	0.91	-0.09
III	before	3.53	3.00	3.17	89.94	0.78	-0.32
	after	2.52	1.00	2.89	114.50	0.95	-0.07

Table 2. Analysis of variance with repeated measurements

	SS	v	MS	F	P
BEFORE-AFTER *Mobilisation	19.600	2	9.800	18.98	0.000

Where: SS – sum of squares of deviations, v – degrees of freedom, MS – mean square of deviations, F- test statistics, p – statistical significance

Table 3. Tuckey's post-hoc multiple comparison tests for equal multiplicities in subsequent measurements

subclass No.	Mobilisa-tion	BEFORE--AFTER	{1} 5.9500	{2} 3.6500	{3} 4.3250	{4} 3.1250	{5} 3.5250	{6} 2,5250
1	I	before		0.0001	0.22	0.001	0.011	0.0001
2	I	after			0.94	0.98	1.00	0.63
3	II	before				0.0001	0.88	0.13
4	II	after					0.99	0.96
5	III	before						0.0001
6	III	after						

Analysis of the results in Table 3 gave grounds to establish significant differences between the mean results before and after p <0.01 for each of the three mobilisations. Significant differences were also found among the results before the first mobilisation and the results after the second mobilisation (p = 0.001) and the third mobilisation (p = 0.0001), and between the results before the first mobilisation and before the 3rd mobilisation (p = 0.011). The results are confirmed by the diagram presented below. Subsequent analyses concerned verification whether the subsequent mobilisations significantly differentiate the effect of therapy achieved during mobilisation. For this purpose, the difference between the before and after results for individual mobilisations was calculated and the average values and standard deviations in individual mobilisations were calculated. The results are shown in Table 4.

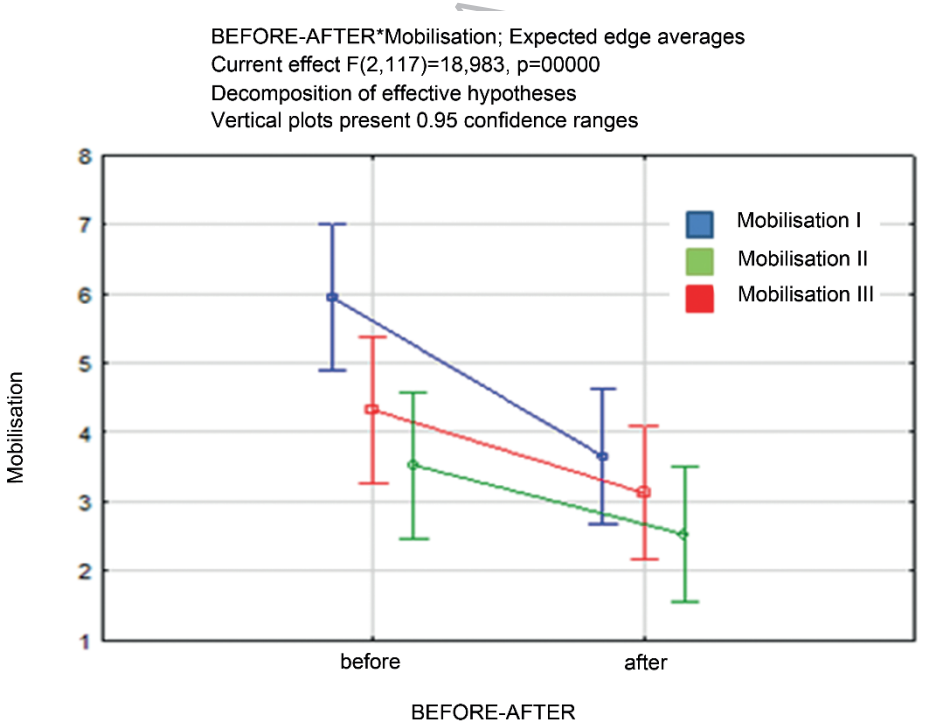


Figure 7. Comparison of average values before and after subsequent measurements in the finger-to-floor test

Table 4. Average values and standard deviations of subsequent measurements in the finger-to-floor test

Mobilisation	Delta effect (before-after) Average	Delta effect (before-after) Standard variation
I	2.30	1.22
II	1.20	0.85
III	1.00	0.93

In the subsequent analyses, a univariate analysis of variance was performed to verify whether the subsequent mobilisations significantly differentiate the effect of the procedure. Analysis results are shown in Table 5.

Table 5. Univariate analysis of variance

	F	P
Delta effect (before-after)	18.98	0.000

The results of the analysis of variance provided grounds for finding significant differences between Delta effects in individual mobilisations. To identify between which mobilisations significant effects occurred, Tuckey's post-hoc multiple comparison test was used.

Table 6. Tuckey's post-hoc multiple comparison test in subsequent finger-to-floor measurements

Mobilisation	{1} M=2.3000	{2} M=1.2000	{3} M=1.0000
I {1}		0.0001	0.0001
II {2}	0.0001		0.65
III {3}	0.0001	0.65	

Analysis of the results gave grounds to conclude that the average effect of the procedure during the first mobilisation was statistically significantly stronger than in the case of the second and third mobilisation. There were no significant differences between the average effect of the second and third mobilisation $p > 0.05$. These results are also confirmed by the graphical interpretation below.

Used as a research method to measure the obtained results, the Thomayer test also has its own interpretation. The universally accepted norm is considered to be the situations where the subject touches the floor with their fingertips while maintaining the full methodology of the implementation. Figure 9 is a graph showing the number of subjects who achieved an improvement in the range of motion at the level of the adopted norm in relation to the effects of individual mobilisations. None of the people participating in the study managed to touch the floor with their fingers with a free lowering of torso forward before the first mobilisation, but 10 people succeeded after the procedure. Before the second treatment, 5 people reached the normal range, and 11 after the mobilisation. In the context of the last attempt, 8 people showed the norm before using mobilisation, while 16 people in the measurement.

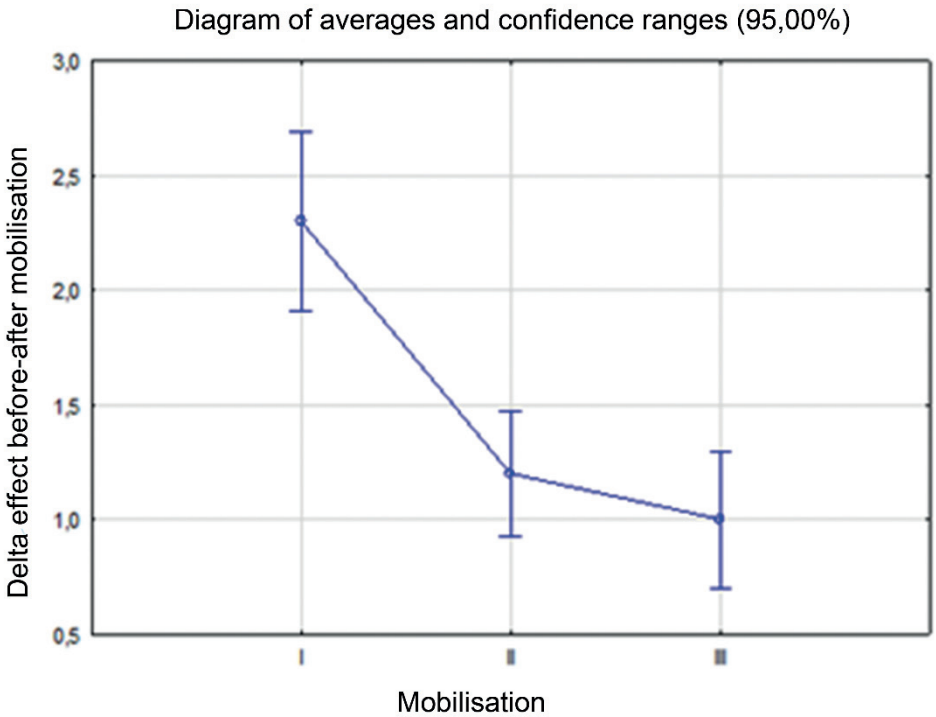


Figure 8. Comparison of average values in three analysed measurements

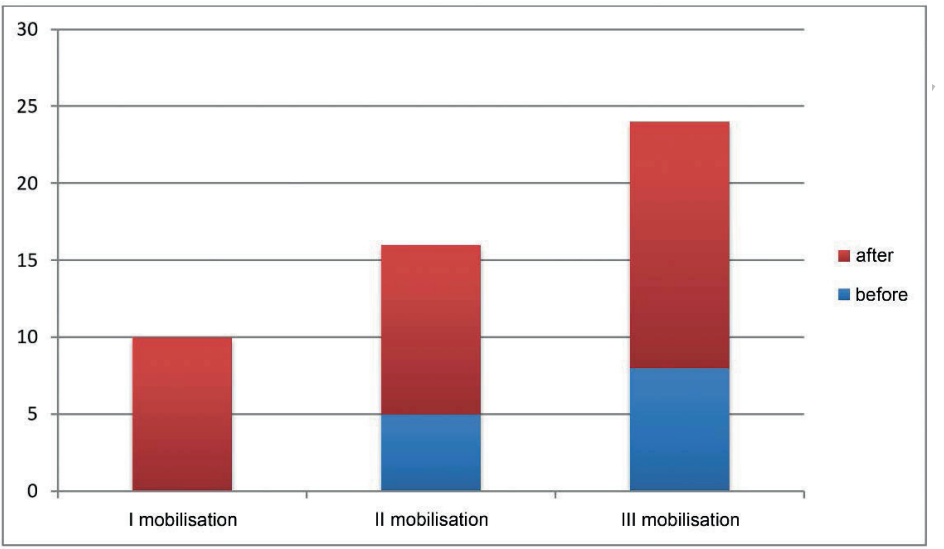


Figure 9. Graph showing the number of people surveyed who reached the extent of torso flexion within the normal range in the Thomayer test before and in relation to individual mobilisations

Discussion

The analysis of the presented results clearly shows that triple mobilisation of plantar aponeurosis in competitors regularly training to compete in the obstacle runs, has an impact on the tension of the posterior fascial chain. The conducted tests prove statistically significant differences among the mobilisation types with statistical significance at $p < 0.01$ in the Tuckey post-hoc test for average effects from individual treatments. The result of data analysis proves that the largest observed differences in measured ranges of mobility relate primarily to the first mobilisation ($p < 0.0001$) and this effect is slightly reduced with each subsequent therapy ($p > 0.05$ for each one). Based on the assessment of the average difference in the effect before, in individual sessions, they are as follows: 1.5 cm after the first mobilisation and 1.2 cm and 1.01 cm after 2 and 3. This result confirms the effect of the procedure, which unfortunately turns out to be weakening in subsequent attempts. These relationships

also show that the improvement in the range of motion obtained in this way is not fully maintained but shows a slight tendency of tension return. This is shown in the compared average differences after 1 before 2, and after 2 before 3 mobilization, where the absolute values were 1.23 cm and 0.4 cm, respectively. This situation, despite a slight deterioration of the result, indicates the progressive durability of the obtained effect. However, to examine this aspect thoroughly, more trials would have to be carried out. Nevertheless, it emphasises the importance of introducing prophylaxis and maintaining adequate elasticity of the plantar aponeurosis in runners. The proof of its effectiveness may be the high post-hoc Tuckey statistical significance index for the analysed relationships: before and after the second mobilisation, where $p = 0.001$ and before the first, and after the third mobilization, where $p = 0.0001$.

Uryzaj et al. in their research presented the effect of deep tissue massage on the tension of the superficial back tape [24]. The study covered over 100 people randomly assigned to 6 groups in which they performed a single mobilisation of certain myofascial areas. In the research group where the plantar aponeurosis was massaged, an average increase in the range of motion in the torso forward inclination was obtained by about 4 cm with $p < 0.001$ statistical significance in the Wilcoxon test. Differences in the selection of the measurement method and less specific criteria for qualifying people to the study group and its size may affect the resulting differences in the average results obtained in both studies after a single mobilisation.

The same authors in a different publication tested in a similar way the differences in posterior anatomic chain tension after mobilising the epicranial aponeurosis, which wasn't included in the previous experiment [25]. The research results proved to be just as effective as it had been previously in relation to its other structures, because the difference in the range of motion of the spine flexion was 3-4 cm with a significance of $p < 0.005$ in the Wilcoxon test. The results of research of both the authors cited in the discussion and my own, which are the clou of the whole work, can be used as another proof of the validity of the model of biomechanics

of the human body created based on the anatomical chains. Additionally, on the example of the plantar aponeurosis, which is a small link in the entire myofascial chain, one can see the integrity of all the structures that it consists of, where each of them, even the smallest one, plays a key role in regulating the tension of the entire system. Bearing in mind the above statement supported by the results analysed in this chapter, one should pay attention to the importance of maintaining adequate flexibility of all structures forming the given chains in the context of injury prevention in physically active people. Plantar aponeurosis mobilisation is a procedure that the therapist's hand is necessary for. In the circles of sports-active people, myofascial auto-loosening using all kinds of rollers and similar devices is becoming more and more popular. They are successfully used on all major muscle groups and their newer forms allow for matching the right size to the area undergoing self-loosening. In the case of plantar aponeurosis, an ordinary tennis ball or its more professional counterparts can be used for this purpose. Research on rolling provides grounds for establishing its effectiveness in maintaining adequate flexibility of the structures of the foot plantar side [26]. Therefore, attention should be paid to the possibilities and necessity of using the above-mentioned methods among physically active people, and particularly the ones training for running sports, as the results of research have shown.

Mleczkowska et al. conducted a study aimed, among other things, at determining the type of the most frequent injuries among runners. 64 regularly running people, mainly at an amateur level, took part in the study group. The research results have shown that since the beginning of their adventure with this sport, more than a half of them have suffered an injury at least once. According to the results of the research, one of the most frequently injured structures is the Achilles tendon (19.5%) and the plantar aponeurosis (14.6%) [27]. The frequency of injuries of these structures may indicate the problem of excessive overloading them among runners, which may result from inadequate physical preparation of the competitors themselves or the lack of flexibility of the myofascial tissue of the mentioned areas [28]. The results obtained from own

research show an improvement in the elasticity of the structures of the posterior anatomical chain and the effect of the treatment lasting over time. The results presented in Fig. 9 prove the improvement in the spinal flexion range in the Thomayer test and maintaining it within normal limits in an increasing number of people tested with each subsequent therapy. Therefore, it can be said that the mobilisation and automobilisation of the plantar aponeurosis, permanently introduced into the training cycle of competitors training for running sports, may reduce the frequency of injuries in these areas. In order to further investigate this relationship, further research in this direction should be carried out on a larger group of subjects and observation of the long-term effect of these treatments.

Conclusions

1. Mobilisation of plantar aponeurosis has an impact on the tension of the posterior anatomical chain in people training for obstacle runs.
2. The average effect of the procedure during the first mobilisation is statistically significantly stronger than in the case of the second and the third mobilisation.
3. The improvement in the range of motion of the spine flexion resulting from subsequent mobilisations tends to persist.

References

1. Uczestnictwo w sporcie i rekreacji ruchowej w 2016 r. Główny Urząd Statystyczny. Warszawa; 2017.

2. https://www.biegamy.pl/bieganie/runmageddon [cited 8.06.2019].

3. https://raptorrun.pl/2018/05/08/ocr-gdy-bieganie-to-za-malo/ [cited 9.06.2019].

4. Żoczek S, Bilewicz-Stabel M, Stabel R. Zależność poziomu świadomości prewencji urazów od stażu biegowego wśród biegaczy amatorów. Roczniki Naukowe Wyższej Szkoły Wychowania Fizycznego i Turystyki w Białymstoku 2018; 24(2).

5. Schleip R et al. Anatomia powięzi podeszwowej. In: Powięź – badanie, profilaktyka i terapia dysfunkcji sieci powięziowych. Wrocław: Wyd. Elsevier Urban & Partner; 2014. pp. 297-298.

6. Krzeszowska E, Książek-Czekaj A, Wiecheć M. Postępowanie terapeutyczne w przypadku entezopatii rozcięgna podeszwowego. Praktyczna Fizjoterapia i Rehabilitacja 2012; 11: 28-29.

7. Kapandji AI. Sklepienie podeszwowe. In: Anatomia Funkcjonalna, Vol. 2, Kończyna dolna. Wrocław: Pub. Elsevier Urban & Partner; 2013. p. 231.

8. Kapandji AI. Sklepienie podeszwowe. In: Anatomia Funkcjonalna, Vol. 2, Kończyna dolna. Wrocław: Pub. Elsevier Urban & Partner; 2013. p. 234.

9. Kapandji AI. Sklepienie podeszwowe. In: Anatomia Funkcjonalna, Vol. 2. Pub. Wrocław: Elsevier Urban & Partner; 2013. p. 236.

10. Bochenek A et al. Powięzie stopy. In: Anatomia Człowieka, Vol. 1. Warszawa: Pub. PZWL; 2016. pp. 930-932.

11. Dziak A, Tayara S. Entezopatia rozcięgna podeszwowego. In: Urazy i uszkodzenia w sporcie. Kraków: Pub. Kasper; 2009. pp. 296-297.

12. Bochenek A et al. Powięzie stopy. In: Anatomia Człowieka, Vol. 1. Warszawa: Pub. PZWL; 2016. p. 932.

13. Schleip R et al. Anatomia powięzi podeszwowej. In: Powięź – badanie, profilaktyka i terapia dysfunkcji sieci powięziowych. Wrocław: Pub. Elsevier Urban & Partner; 2014. p. 298.

14. Grimshaw P et al. Biomechaniczny opis biegu. In: Biomechanika Sportu. Warszawa: Pub. PWN; 2010. pp. 245-250.

15. https://treningbiegacza.pl/artykul/zapalenie-rozciegna-podeszwowego-czyli-czesta-przypadlosc-biegaczy-i-nie-tylko [cited 7.06.2019].

16. Grimshaw P et al. Biomechaniczny opis biegu. In: Biomechanika Sportu. Warszawa: Pub. PWN; 2010. pp. 258-259.

17. Larson P et al. Foot strike patterns of recreational and sub-elite runners in a long-distance road race. Journal of Sports Sciences 2011; 29(15): 1665-1673.

18. Schleip R et al. Anatomia powięzi. In: Powięź – badanie, profilaktyka i terapia dysfunkcji sieci powięziowych. Wrocław: Pub. Elsevier Urban & Partner; 2014. pp. 5-65.

19. Sakada S. Mechanoreceptors in fascia, periosteum and periodontal ligament. Bull Tokyo Med Dent Univ 1974; 21: 11-13.

20. Schleip R, Kurkowski M. Mechanoreceptory tkanki łącznej. Furtka do zmiany napięcia mięśni szkieletowych. Praktyczna fizjoterapia & rehabilitacja 2018; 76: 18-23.

21. Huijing PA. Epimuscular myofascial force transmission: a historical review and implications for new research. International Society of Biomechanics Muybridge Award Lecture, Taipei 2007. J Biomech 2009; 42(1): 9-21.

22. Ostiak W, Kaczmarek-Maciejewska M, Kasprzak P. Stopa i goleń w ujęciu Taśm Anatomicznych. The Journal of Orthopaedics Trauma Surgery & Related Reserch 2011; 5(25): 39-41.

23. Myers TW. Taśma powierzchowna tylna. In: Taśmy Anatomiczne, Meridiany Mięśniowo-Powięziowe dla Terapeutów Manualnych i Specjalistów Leczenia Ruchem. DB Publishing. Warszawa; 2010.

24. http://ofizjo.pl/artykuly/tasmy-anatomiczne-tasma-powierzchowna-tylna-przedstawienie-koncepcji thomasa-w-mayers/ [cited 10.06.2019].

25. Uryzaj R, Kuklińska A, Cabak A. Wpływ masażu tkanek głębokich na obniżenie napięcia struktur taśmy powierzchownej tylnej. Medycyna Sportowa 2016; 3(4): 157-163.

26. Uryzaj R, Kuklińska A, Cabak A. Wpływ masażu tkanek głębokich okolic mięśnia czołowego oraz czepca ścięgnistego na elastyczność taśmy powierzchownej tylnej. Medycyna Sportowa 2018; 1(4): 35-39.

27. Grieve R et al. The immediate effect of bilateral self myofascial release on the plantar surface of the feet on hamstring and lumbar spine flexibility: A pilot randomised controlled trial. Journal of Bodywork & Movement Therapies 2015; 19: 544-552.

28. Mleczkowska A et al. Najczęstsze kontuzje wśród osób regularnie biegających. Ostry Dyżur 2016: 121-123.

Journal of Health Study and Medicine
2019, nr 2
ss. 53-75
DOI 10.36145/JHSM.2019.11

Quality of Life of Patients After Stroke – Observational Research

Marlena Krawczyk-Suszek[1]
https://orcid.org/0000-0003-4100-588X

[1] Department of Physiotherapy, Faculty of Medicine, University of Information Technology and Management in Rzeszow, Rzeszów, Poland

Address for correspondence

Marlena Krawczyk-Suszek
Department of Physiotherapy, Faculty of Medicine, University of Information Technology and Management in Rzeszow
2 Sucharskiego Str., 35-225 Rzeszów, Poland
e-mail: m.krawczyk.umlub@gmail.com

Abstract

Background and objective: *The quality of life of patients after stroke is a determinant of human existence. The aim of the research was to assess the quality of life of patients after stroke.*

Material and method: *The research involved 117 patients after stroke. The criteria to be included in the research were: a time of at least 1.5 years from the last stroke, logical contact with the patient, lack of mental illness and other chronic diseases apart from risk factors for stroke. The research tool was a questionnaire SF-36v.2. The test results at the level of p≤0.05 were considered statistically significant.*

Results: *Patients in the general quality of life of ILQ obtained 60.1% of the maximum number of points. The lowest average level of LQ was noted in terms of physical role:19.2±2.8, emotional role:14.0±3.2 and physical functioning:30.9±14.5. The quality of life of patients significantly determined the number of strokes (p<0.05). The first stroke of the participants significantly reduced the quality of life compared to patients after two strokes. Conducting home rehabilitation (HR), adjusted to individual patient's dysfunctions significantly increased the quality of life in the patients of the research (HR:100.1pts.; without:125.5pts.; p=0.000<0.05).*

Conclusions: *The patients after stroke assessed mental dimension significantly better compared to the physical quality of life.*

Key words: *stroke, quality of life, SF–36 questionnaire, rehabilitation*

Introduction

Stroke is one of the most common cardiovascular diseases. Currently there are over 55 million people in the world who have suffered stroke, and in half of them this disease has significantly impacted on functioning in everyday life [1]. For this reason, it is extremely important to implement effective rehabilitation, which should be aimed at compensating for lost psychophysical functions or restoring dysfunction. Rehabilitation is also a form of secondary prevention, the aim of which is to minimize the risk of another stroke [2]. Comprehensive rehabilitation of patients after stroke affects both the physical and mental spheres and may significantly determine the quality of their lives

The quality of life in the definition includes the ability to function physically, mentally and socially in relation to the limitations caused by the disease [3]. Lower quality of life after stroke is mainly caused by reduced physical fitness and dependence on caregivers, depression and lack of social support. The research of the quality of life of people after stroke serves to recognize the different conditions of functioning of these people, which, according to the Helsingborg Declaration, is an important condition for proper rehabilitation planning [4]. It also allows to look at the effectiveness of the treatment perceived by the patient and helps to modify the patient's therapy [5]. Aim: Assessment of the quality of life after stroke.

Materials and Methods

Questionnaire

The research was conducted using the own structure questionnaire supplemented with a standardized tool to assess the quality of life SF-36v.2.

In the analysis of data from the SF-36v.2 quality of life questionnaire, the quality of life was assessed in the following dimensions: physical functioning – PF; role physical – RP; bodily pain – BP; general health – GH; vitality – VT; social functioning – SF; role emotional – RE; mental health – MH. SF-36v.2 questionnaire contains one unspecified question

(question 2) regarding the change in the general, subjective health of respondents during the last year.

The individual parameters were combined into groups, adding four parameters concerning the assessment of the physical sphere of the quality of life and four parameters of the mental zone. The following assignment was made: PF+RF+BT+GH = Physical Component Summary (PCS); VT+SF+RE+MH = Mental Component Summary (MCS). Both of these dimensions constitute the Quality of Life Index (ILQ). The higher the point value in the analysed scale is, the lower the level of the felt quality of life of the patient being researched is. The maximum number of points to be obtained according to the key proposed by Prof. J. Tylka is 171 [6].

The research was not subject to any risk. The study was conducted in accordance with the Declaration of Helsinki.

Respondents

117 patients with stroke regardless of etiology were included in the research. In order to analyse and assess the quality of life of the patients, the criteria of inclusion in the research were adopted: time: at least 1.5 years from the last stroke to assess the quality of life (the 1st criterion) and logical contact with the patient (the 2nd criterion), no chronic diseases beyond risk factors stroke (the 3rd criterion), no mental illness (the 4th criterion).

The rehabilitation procedure at various stages of the disease was recorded for all subjects. Rehabilitation was individually adjusted to the clinical condition of the patient; it was not the main factor differentiating the group of the researched patients. The overall impact of rehabilitation planned individually for the patient, on the quality of life of the patients was assessed.

The research was anonymous and voluntary. The patient was informed about the possibility of resigning from participation in the research at any stage.

The research did not bear any risk. The respondents were only obliged to complete the questionnaire supplemented with a standardized questionnaire. The subject of the research was the current subjective assessment of

the quality of life. The treatment and rehabilitation process were conducted by medical facilities in accordance with medical recommendations.

The sociodemographic characteristics of the research group are shown in table 1.

Table 1. General characteristics of the research group of the patients. Sociodemographic data, categorical variables

Characteristic	n	%
Gender (n – 117) - female / male	57 / 60	48.7 / 51.3
Education (n – 117) - higher / secondary / vocational / lack of education	37 / 25 / 25 /30	31.6 / 21.4 / 21.4 /25.6
Stroke Type (n – 117) hemorrhagic (HS)/ ischemic (IS)	55 / 62	47.0 / 53.0
Number of strokes (n – 117) - 1 / 2	88 / 29	75.2 / 24.8
Paretic Side left / right	62 / 55	53.0 / 47.0
Start time of rehabilitation (n – 117) - till the 3rd day / 4 – 7 day / 8 days – month / over a month	58 / 36 14 / 9	49.6 / 30.8 12.0 / 7.7

Source: own study.

Statistical analysis

A stratified random sampling was used to create two groups of the patients after stroke with different etiology. Continuous variables did not meet the normal distribution assumptions. Shapiro Wilk's test rejected the hypothesis of normality of distribution. Descriptive statistic and non-parametric statistics were used to compare two independent groups (U Mann-Whitney). The correlation between measurable variables (few groups) was assessed using the Spearman rank correlation coefficient. The test power was verified with the assumption of H0 hypothesis: Mi1 ≤ Mi2, where the average quality of life in the patients after the first stroke is lower than the average quality of life of people after two strokes (t test of two averages: t = 1.658). The test power with the probability of the 1st degree

error set at the level of p = 0.05, amounted to 0.81. The statistical analyses were performed with STATISTICA 13.0 PL. The test results at the level of p ≤ 0.05 were considered statistically significant.

Results

The respondents' age was on average 58.8 ± 11.8 years old. 47.0% out of total indicated the occurrence of stroke twice, the others declared the occurrence of only one stroke. Among the respondents, 49.6% started rehabilitation in the first three days, and the next 30.8% during the first week after stroke. In the group of people whose physiotherapeutic activity started over 8 days, the patients after haemorrhagic stroke were significantly more frequent (HS: 38.2% from the group; IS: 3.2% from the group; Pearson's Chi^2 = 29.04367; p = 0.000). The average time from stroke in the research group was 25.5 ± 8.2 months. On average, the rehabilitation process was conducted in the home environment of the patient for the longest period of time – 2.5 ± 1.7 months. Rehabilitation conducted in the neurological ward lasted on average 2.2 ± 1.2 months, in the rehabilitation ward 1.9 ± 2.1 months (table 2).

While analysing ILQ and its individual dimensions, the significant impact of gender, age, education, type of stroke as well as the side of paralysis (p> 0.05) was not confirmed. The level of the perceived quality of life in each dimension significantly determined the number of strokes of the patient (p < 0.05) (table 3).

The quality of life in the research group significantly depended on the number of stroke impacts in terms of perceived pain (p = 0.027) and social roles (p = 0.009). After the first stroke in both aspects (BP and SF), the patients assessed the quality of life as worse compared to the patients after two strokes. The general quality of life as well as the physical (PCS) and mental (MCS) dimensions were assessed worse by the patients after the first stroke at the time of the research. In SF-36 questionnaire (ILQ), the patients after two strokes obtained a significantly lower value of points, which means a subjective sense of a higher level of the quality of life compared to the second group (the patients after one stroke). (table 4).

Table 2. General characteristics of the group, taking into account the place and length of rehabilitation. Continuous variables

Variable	M	SD	Reference	Me	Q1	Q3
Age (n - 117) [years]	58.8	11.8	39.0-88.0	58.0	49.0	67.0
Time after last stroke (n - 117) [months]	25.5	8.2	18.0 – 48.0	24.0	18.0	28.0
Time of rehabilitation conducted in: [months]						
neurological / stroke ward (n – 117)	2.2	1.2	1.0 – 6.0	2.0	1.0	3.0
rehabilitation ward (n – 61)	2.0	0.9	1.0 – 6.0	2.0	1.0	2.0
rehabilitation office (n – 56)	1.9	2.1	1.0 – 16.0	1.0	1.0	3.0
home rehabilitation (n – 105)	2.5	1.7	0.25 – 12.5	2.0	1.0	3.5

*M – mean; SD – standard deviation; Reference – minimum to maximum; Me - median; Q1 - lower quartile; Q3 – upper quartile.

Table 3. Analysis of factors determining the level of quality of life and its dimensions

ILQ vs	PCS	MCS	ILQ
	p		
Gender (n – 117)	0.73	0.69	0.77
Age (n – 117)	0.88	0.91	0.87
Education (n – 117)	0.50	0.62	0.54
Stroke Type (n – 117)	0.30	0.61	0.76
Number of strokes (n – 117)	*0.02	*0.03	*0.01
Paretic Side (n – 117)	0.18	0.29	0.07

* p - level of statistical significance

Table 4. The level of restrictions of the patients in terms of quality of life in different spheres

Questionnaire SF-36	Analyse					
	$\overline{x}$	SD	Me	Reference	*	**
PF	30.9	14.5	30.0	0 – 50	50	61.8
RF	19.2	2.8	20.0	5 – 20	20	96.0
BP	3.3	2.6	3.0	0 – 9	9	36.7
GH	10.6	2.5	11.0	6 – 17	20	53.0
VT	10.2	3.0	10.0	4 – 18	20	51.0
SF	3.4	1.7	3.0	0 – 8	8	42.5
RE	14.0	3.2	15.0	0 – 15	15	93.3
MH	10.7	4.9	11.0	1 – 23	25	42.8
Subjective sense of change in health	1.6	1.1	1.0	0 – 4	4	40.0
PCS	64.1	19.0	64.0	18 – 95	99	64.7
MCS	38.7	8.6	39.0	13 – 60	68	56.9
ILQ SF – 36	102.7	24.0	102.0	47 – 155	171	60.1

*- Maximum number of points to be obtained in a given sphere; ** - Percentage of points from the maximum; PF – physical functioning; RF – role physical; BP – bodility pain; GH – general health; VT – vitality; SF – social functioning; RE – role emotional; MH – mental health; PCS – Physical Component Summary; MCS – Mental Component Summary; IQL SF – 36 – Index of Life Quality

The analysis of data transformed according to the key presented by Professor Jan Tylka is presented below. In the overall quality of life, the patients averagely obtained 60.1% of the maximum number of points, which confirms a significantly reduced quality of life. The average value of points obtained in SF-36 scale was 102.7 ± 24.0. The researched patients showed a lower level of the quality of life in the physical dimension (PCS: 64.1 ± 19.0). The worst-rated aspects of life of the patients after stroke involve physical functioning (PF: 30.9 ± 14.5; 61.8% **), restrictions in performing social roles caused by physical sphere (RF: 19.2 ± 2.8; 96.) 0% **and limitations in performing social roles resulting from emotional problems (RE: 14.0±3.2; 93.3%**) (table 5).

Table 5. Average quality of life, including the number of strokes

Questionnaire SF-36	Number of strokes				p
	1		2		
	M	SD	M	SD	
PF	32.6	13.0	25.6	17.6	0.057
RF	19.4	2.4	18.8	3.7	0.507
BP	3.6	2.5	2.5	2.9	0.027
GH	10.7	2.5	10.4	2.7	0.592
VT	10.2	3.0	10.1	3.1	0.570
SF	3.6	3.0	2.8	1.8	0.009
RE	14.4	2.2	12.8	5.1	0.074
MH	10.9	4.9	9.9	5.1	0.307
Subjective sense of change in health	1.7	1.1	1.4	1.0	0.358
PCS	66.3	17.2	57.2	22.4	0.043
MCS	39.7	7.8	35.6	10.4	0.029
IQL SF – 36	106.0	21.2	92.9	29.2	0.010

*PF – physical functioning; RF – role physical; BP – bodility pain; GH – general health; VT – vitality; SF – social functioning; RE – role emotional; MH – mental health; PCS – Physical Component Summary; MCS – Mental Component Summary; IQL SF – 36 – Index of Life Quality; M - mean; SD – standard deviation; p - level of statistical significance;

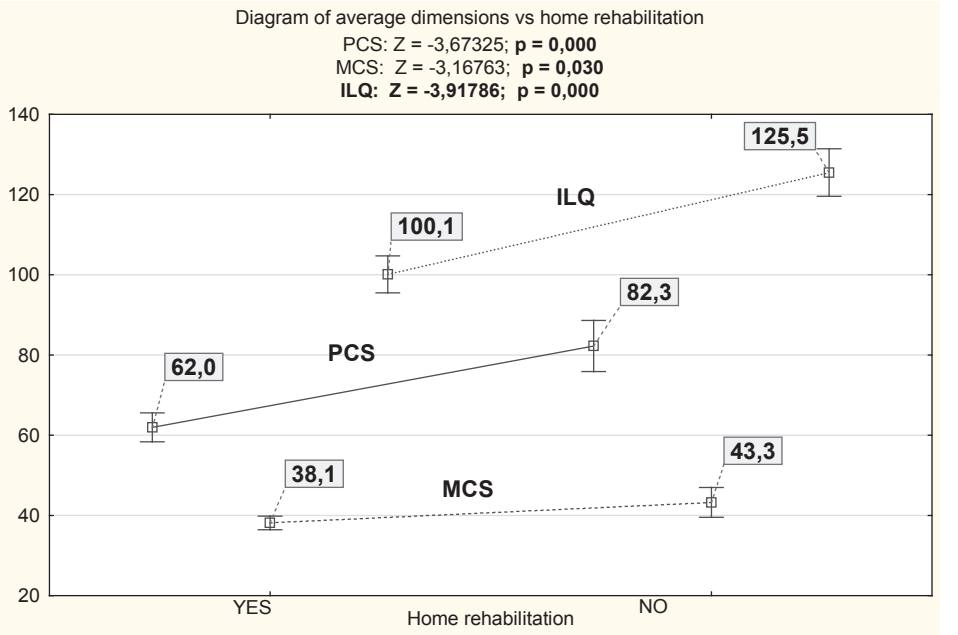
The presence of a significant correlation of individual components of the quality of life against the overall ILQ assessment was confirmed ($p < 0.001$). The strongest positive correlation in relation to the overall quality of life of the researched patients was noted in the following components of the quality of life: PF ($R = 0.91$), MH ($R = 0.83$), SF ($R = 0.82$) and BP ($R = 0.81$). The weakest correlation was recorded in: RF ($R = 0.38$) and RE ($R = 0.44$) (table 6).

Table 6. The impact of individual components on the overall quality of life of the researched patients

ILQ vs.	R	p
PF	0.91	≤ 0.001
RF	0.38	≤ 0.001
BP	0.81	≤ 0.001
GH	0.64	≤ 0.001
VT	0.71	≤ 0.001
SF	0.82	≤ 0.001
RE	0.44	≤ 0.001
MH	0.83	≤ 0.001

*R-value of Spearman's rank correlation; p - differences significance level

105 patients, out of the total number of the researched patients, continued rehabilitation in the home environment. Two dimensions were assessed: PCS, MCS and the general quality of life index – ILQ, assessed using SF-36v.2 standardized tool. There was a significantly lower ILQ level in the group of the patients who did not involve in home rehabilitation (higher point value means a reduced sense of the quality of life, $p < 0.001$). Significantly statistical differences were observed in each of the analysed dimensions ($p < 0.05$) (figure 1).



* PCS – Physical Component Summary; MCS – Mental Component Summary; ILQ SF – 36 – Index of Life Quality

Figure 1. Average quality of life of patients after stroke including home rehabilitation

The presence of a statistically significant relationship between the quality of life of the researched patients and the length of rehabilitation conducted in the neurological ward and the rehabilitation ward was confirmed. In the case of the neurological ward, the time of rehabilitation significantly impacted the quality of life of the respondents in the physical, mental and general dimensions. In the neurological ward, rehabilitation is conducted during the early rehabilitation period, whereas in the case of rehabilitation conducted in the rehabilitation ward, a significant impact was noted in the mental and general dimensions of the quality of life. The values of the correlation coefficient R were positive for the listed relationships. This means that the longer rehabilitation (in the neurological and rehabilitation ward) is, the more points were obtained by the patients on SF-36 scale. The quality of life of the researched patients decreased along with the length of rehabilitation time ($p < 0.001$). This relation

may be applied to the group of patients where the presence of complex dysfunctions in the patient after stroke determines a longer stay in the neurological ward and a worse functional state of the patient reducing the overall quality of life. Negative correlation of the quality of life with regard to the length of home rehabilitation and time after the last stroke in all analysed dimensions of the quality of life was indicated. If the value of points in SF-36 questionnaire increased (worse quality of life), the time after stroke decreased (shorter time of home rehabilitation) and vice versa. This means that the shorter the time after stroke (and the shorter the time of rehabilitation in the home environment) is, the subjective quality of life of the patient is lower. However, the longer the period after stroke (and longer time of home rehabilitation) is, the better the patient's quality of life is (table 7).

Table 7. Assessment of the relationship between the quality of life of the researched patients and the length of rehabilitation

Variables:	ILQ					
	PCS		MCS		ILQ	
Length of rehabilitation:	R	p	R	p	R	p
- hospital (neurological ward)	*0.44	0.000	*0.33	0.000	*0.46	0.000
- hospital (rehabilitation ward)	0.44	0.056	*0.32	0.011	*0.28	0.017
- rehabilitation study	-0.04	0.723	0.16	0.206	0.02	0.886
- environmental rehabilitation at home	-0.09	0.304	-0.10	0.261	-0.09	0.317
Time after the last stroke	-0.15	0.103	-0.09	0.332	-0.15	0.101

* statistical significance; R-value of Spearman's rank correlation; p - differences significance level

Discussion

In addition to the length of life, the assessment of the patient's quality of life is a particularly important factor in assessing the effectiveness of

treatment. There are many different definitions of the quality of life, but it most often consists of many different factors, not only physical, but also psychological and social, and their assessment is made by the patient himself/herself [7]. The quality of life assessment also provides information about the impact of the disease itself and the effects of its treatment on various areas of the patients' lives, which helps to improve the examination methods, treatment effectiveness and shape the quality of life.

The average level of the quality of life of the respondents was average. The researched patients rated the quality of their life in the mental dimension a bit higher than in the physical dimension. Reduced quality of life in the physical dimension is confirmed by another research [8, 9, 10].

Bodzek et al. researched 53 patients after stroke. The average assessment of the patients' quality of life deteriorated as a result of stroke. However, it was defined at the level between medium and good [11]. Similar results were also obtained in the research by Bejer and Kwolek, which covered 39 people after stroke. These authors, similarly to Bodzek et al., used SJŻUM scale in their research [12]. Somewhat different results were obtained in the research by Hartman-Maier et al., which covered 56 Israeli patients. Only 33% of them were satisfied with life as a whole [13]. The results of the research by Tasiemski et al involving 25 patients after stroke were similar. Only every fourth respondent was satisfied with life as a whole [14]. In the research that concern patients after ischemic or haemorrhagic stroke, the impact of the stroke type on the quality of life of the patient is not usually described, which may indicate that the stroke type is not a factor differentiating the quality of life of the patient. In this research, the impact of the stroke type on the perceived level of the quality of life was also not confirmed ($p > 0.05$). In addition, no significant impact of demographic characteristics on the perceived level of the quality of life in the research group ($p > 0.05$) was demonstrated.

In this research, all researched patients were subject to comprehensive rehabilitation, while in the case of half of them, rehabilitation was implemented within 3 days after stroke. The vast majority of the respondents considered that the applied rehabilitation impacted the improvement of

their health, especially in relation to home rehabilitation ($p < 0.05$). There was a significant difference in the average quality of life as well as a significantly better quality of life in the physical and mental dimensions in the group of the patients who conducted home rehabilitation. Other authors confirm significantly improved fitness of the researched people. It was also indicated that the fastest improvement in fitness was obtained by the patients who conducted rehabilitation in the early period after stroke (up to 1 month). The use of PNF (Proprioceptive Neuromuscular Facilitation) therapy in the patients after ischemic stroke located in the left hemisphere impacted by movement and coordination dysfunction on the right side of the body increases fitness in 70% of the respondents as a result of rehabilitation [15]. There is also a positive effect of the therapy on the improvement of shoulder and shoulder bone rhythm and the increase in the function of the upper limb, mainly through the control of motion in space [16]. Intensive rehabilitation, especially with regard to the time devoted to individual therapy of daily activities, provides better functional results of the therapy [17]. The individual ability to cope with difficult situations, which is conditioned by personality traits of the patient, is also crucial [18].

The research on the effectiveness of home rehabilitation is confirmed by all used scales: Rankin, Brunnström and locomotion possibilities, in which a significant improvement in the functional status of the patients was noted [19]. In addition, the use of comprehensive rehabilitation impacts on the improvement of both functional and mental state in the patients after ischemic stroke, and thus the assessment of the quality of life of the patients [20]. Conducting comprehensive therapy allows the assessment of the effects of early rehabilitation during hospitalisation of the patients with ischemic stroke. There is a statistically significant improvement in self-care and everyday activities in the study groups [21]. Pasek et al., assessing everyday activities depending on the subtype of ischemic stroke and conducted rehabilitation, showed a significant improvement in the quality of life based on the Rivermead Mobility Index.

In addition, the research confirmed the positive impact of early rehabilitation on the results of rehabilitation of the patients after stroke. The patients after post-hospital rehabilitation within one month after stroke revealed better results compared to the patients who started treatment after 2 months [22]. The importance of early rehabilitation in reconstructing lost functional abilities was also demonstrated by Bernhardt et al. The authors achieved optimal functional results in the first day after stroke [23].

The literature reports that locomotion improved due to several weeks of rehabilitation in the patients after ischemic stroke referred to further post-hospital rehabilitation. In addition, the recovery of the ability to move independently to varying degrees positively impacted on the patients' psyche and justified the need to continue rehabilitation. The effects of improvement visible in the performance of everyday activities mobilised. The initial low self-esteem of one's state of health occurring after stroke caused a temporary loss of social contacts and an initial weakening of family ties, which in turn caused progressive deterioration of well-being, including depression [24, 25, 26]. The improvement in health caused the improvement of lost ties, and in some people, it increased interest in sport as a form of rehabilitation. The author concluded that rehabilitation of the patients conducted as part of rehabilitation with the use of specialized kinesitherapy methods significantly contributed to the improvement in gross (gait) and low (manual) motor skills [27]. In our own research it was observed that the longer the time after stroke is, the quality of the patient's life increased slightly (ILQ: R= -0.15). Considering that each of the researched patients had individual planned rehabilitation, the reduction of dysfunctions significantly increased the overall quality of life of the patients.

The importance of early and comprehensive rehabilitation for the quality of life of the patients after stroke is confirmed by the guidelines for post-stroke management. Based on articles signed by the European Stroke Organization and the Polish Neurological Society, Mazurek et al. claim that rehabilitation of the patients after stroke should be coordinated and

multidisciplinary. It is proposed to start it early, although there is no optimal time to implement the improvement. Active rehabilitation should, however, be started immediately after the patient's general condition stabilized. The authors also state that the quality and organization of rehabilitation care are more important than the number of hours of therapy, and physiotherapists should choose therapeutic agents individually to the patient's needs [28].

In addition, the research confirmed a significant relationship between the quality of life (general and in both dimensions – physical and mental) and the length of rehabilitation. It is also necessary to measure the functionality of the patients because the presence of many dysfunctions in the motion system often determines a longer stay in hospital and rehabilitation wards, which may also be a factor that reduces the quality of life of the patient.

The research also confirmed the existence of dependence between individual components of the quality of life and its overall assessment. The patients subject to this research were on average approximately 25.5 ± 8.2 months after the last stroke, therefore rehabilitation includes therapeutic activities in the patient's environment. At the time of the research, the patients indicated that their overall quality of life was determined the most by the sphere of physical functioning (R = 0.91) and social functioning (R = 0.82), as well as mental health (R = 0.83) and pain sensation (R = 0.81). The values of the R factor in each of the exchangeable quality of life dimensions were positive and increased with the increase in the total number of the ILQ points. This means that the patient's functionality in the physical and social dimension, pain complaints and his/her subjective sense of mental health are important factors determining the overall quality of life, and in the case of a positive correlation significantly lowering the quality of life (increase in the SF-36 score). The significance of these factors confirms the great importance of psychological and social support for the patients after stroke who are in the process of adaptation to their own environment [29, 30], as well as further comprehensive rehabilitation aimed at reducing physical dysfunctions and pain. The literature of the sub-

ject confirms the great impact of fulfilling social roles, functioning of the upper limb and self-care on the negative assessment of the quality of life [31]. It is worth noting that the respondents claimed that limitations in the field of physical quality of life were not the most severe, but limitations in the performance of social roles were the most painful, including the socio-environmental limitations [32]. In addition, the presence of dysfunctions of the upper and lower limbs, dysfunctions in the field of vision, speech, mental disorders and problems in perception of the world and problems in the field of interpersonal communication, dysphagia, increase the probability of psychological disorders in the patient, which in turn reduces the sense of the quality of life, therefore, it is important to conduct comprehensive therapy in this area [33, 34, 35].

The improvement of the psychophysical state and the general quality of life of the patient after stroke as a result of rehabilitation is unquestionable. Its range may depend on the moment of starting rehabilitation, individual planning of therapy for the patient, the occurrence of coexisting diseases. It is worth conducting research on the impact of rehabilitation, and more recently available methods and therapies, on the functional level of the patient after stroke, to maximally reduce the resulting dysfunctions and improve the quality of life of the patient after stroke.

Conclusions

- The patients assessed the mental dimension of the quality of life slightly better than in the physical dimension.
- The patients after the second stroke reported a significantly higher level of the quality of life compared to those after one stroke.
- Conducting long-term comprehensive rehabilitation in the post-acute period and environmental rehabilitation is important in the aspect of improving the quality of life in the physical dimension of the patient after stroke.
- In the mental dimension of the quality of life, the patients stated that the largest problem involved limited social roles resulting from emotional problems.

- It is important to provide psychological support to the patients after stroke, to increase their assimilation with the environment and to reduce psychological barriers.

Funding: This research received no external funding.
Acknowledgments: This study was conducted from personal funds.
Conflicts of Interest: The authors declare no conflict of interest.

References

1. Paul SL, Srikanth VK, Thrift AG. The large and growing burden of stroke. Curr Drug Targets 2007; 7: 786-93.

2. Bejer A, Probachta M, Trojan G, Szeliga E, Pikuła, D. Wpływ kompleksowej rehabilitacji szpitalnej na jakość życia osób po udarze mózgu. Young Sport Science of Ukraine 2013; 3: 6-12.

3. Tylka J. Czy badanie jakości życia jest dobrym kryterium oceny skuteczności rehabilitacji? Rehabilitacja Medyczna 2003; 7(4): 50-3.

4. Tylka J. Jakość życia po udarze mózgu. Część I — badania prospektywne. Udar Mózgu 2001; 3(1): 55-62.

5. Tylka J. Jakość życia w odniesieniu do rehabilitacji kardiologicznej. Rehabilitacja Medyczna 2002; 6(1): 52-6.

6. Tylka J. SF-36 questionnaire – final part of discussion. Kardiol Pol 2010; 68(8): 985.

7. Jaracz K, Kozubski W. Quality of life in stroke patients. Acta Neurologica Scandinavica 2003;107(5): 324-9.

8. Bugge C, Hagen, S, Alexander H. Measuring stroke patients' health status in the early post-stroke phase using the SF36. Int J Nurs Stud 2001; 38: 319-27.

9. Hopman WM, Verner J. Quality of life during and after inpatient stroke rehabilitation. Stroke 2003; 34: 801-5.

10. Kauhanen ML, Korpelainen JT, Hiltunen P, Nieminen P, Sotaniemi KA, Myllyla VV. Domains and determinants of quality of life after stroke caused by brain infarction. Arch Phys Med Rehabil 2000; 81: 1541-6.

11. Bodzek S, Franek G, Nowak-Kapusta Z. Wybrane aspekty jakości życia chorych po niedokrwiennych udarach mózgu. Pielęgniarstwo Neurologiczne i Neurochirurgiczne 2016; 5(2): 69-75.

12. Kwolek A, Bejer A. Ocena jakości życia osób starszych po udarze mózgu – doniesienie wstępne. Fizjoterapia 2008; 16(1): 52-63.

13. Hartman-Maier A, Soroker N, Ring H, Avni N, Katz N. Activities, participation and satisfaction one-year post stroke. Disability Rehabilitation 2007; 29: 559-66.

14. Tasiemski T, Knopczyńska A, Wilski M. Jakość życia osób po udarze mózgu — badania pilotażowe. Gerontologia Polska 2010; 18(3): 128-33.

15. Kaniewski O, Suszyński K, Górka D et al. Wpływ terapii PNF na proces poprawy motorycznej u pacjentów po niedokrwiennym udarze mózgu zlokalizowanym w lewej półkuli w okresie ostrym rehabilitacji. Annales Academiae Medicae Silesiensis 2014; 68(5): 294-301.

16. Skatulska I, Śliwiński Z. Zespół bolesnego barku w aspekcie zespołu przeciążeniowego mięśni rotatorów. Medycyna Sportowa 2002; 18(12): 513-8.

17. Kwakkel G, Peppen R, Wagenaar RC. Effects of augmentem exercise therapy time after stroke: a metaanalysis. Stroke 2004; 35: 2529-39.

18. Darlington ASE, Dippel DWJ, Ribbers GM, van Balen, R, Passchier J, Busschbach JJV. Coping Strategies as Determinants of Quality of Life in Stroke Patients: A Longitudinal Study. Cerebrovasc Dis 2007; 23: 401-7.

19. Szczygielska D, Pop T, Maciejczak A. Ocena postępów rehabilitacji prowadzonej w domu pacjenta z rozpoznanym udarem mózgu. Przegląd Medyczny Uniwersytetu Rzeszowskiego 2009; 2: 174-9.

20. Starosta M, Niwald M, Miller E. Skuteczność kompleksowej rehabilitacji po pierwszym w życiu udarze niedokrwiennym mózgu. Polski Merkuriusz Lekarski 2015; 227: 51-4.

21. Trochimiuk J, Kochanowski J, Stolarski B. Efekty wczesnej rehabilitacji w okresie pobytu szpitalnego pacjentów z udarem niedokrwiennym mózgu. Rehabilitacja Praktyczna 2009; 4: 15-9.

22. Pasek J, Opara J, Pasek T. Ocena czynności życia codziennego w zależności od podtypu przebytego udaru niedokrwiennego mózgu i przeprowadzonej wczesnej rehabilitacji. Udar Mózgu 2009; 11(2): 41-9.

23. Bernhardt J, Chan J, Nicola I. Little therapy, little physical activity: rehabilitation within the first 14 days of organized stroke until care. Rehabilitation Medicine 2007; 39: 43-8.

24. Carod-Artal J, Egido JA, Gonzalez JL, Varela de Seijas E. Quality of life among stroke survivors evaluated 1 year after stroke: experience of a stroke unit. Stroke 2000; 31: 2995-3000.

25. Kauhanen ML, Korpelainen JT, Hiltunen P, Nieminen P, Sotaniemi KA, Myllyla VV. Domains and determinants of quality of life after stroke caused by brain infarction. Arch Phys Med Rehabil 2000; 81: 1541-6.

26. Suenkeler IH, Nowak M, Misselwitz B et al. Timecourse of health-related quality of life as determined 3, 6 and 12 months after stroke. Relationship to neurological deficit, disability and depression. J Neurol 2002; 49: 1160-7.

27. Nadulska A. Lokomocja i samoobsługa u pacjentów po przebytym udarze niedokrwiennym mózgu usprawnianych kinezyterapeutycznie. Zeszyty Naukowe WSSP 2013; 17: 97-106.

28. Mazurek J, Blaszkowska A, Rymaszewska J. Rehabilitacja po udarze mózgu – aktualne wytyczne. Nowiny Lekarskie 2013; 82(1): 83-8.

29. Carod-Artal FJ, Egido JA. Quality of Life after Stroke: The Importance of a Good Recovery. Cerebrovasc Dis 2009; 27(suppl 1): 204-14.

30. Jönsson AC, Lindgren I, Hallström B, Norrving B, Lindgren A. Determinants of Quality of Life in Stroke Survivors and Their Informal Caregivers. Stroke 2005; 36(4): 803-8.

31. Bodzek S, Franek G, Nowak-Kapusta Z. Wybrane aspekty jakości życia chorych po niedokrwiennych udarach mózgu. Pielęgniarstwo Neurologiczne i Neurochirurgiczne 2016; 2: 69-75.

32. Bejer A, Probachta M, Trojan G, Szeliga E, Pikuła D. Wpływ kompleksowej rehabilitacji szpitalnej na jakość życia osób po udarze mózgu. Young Sport Science of Ukraine 2013; 3: 6-12.

33. Smith TM, Pappadis MR, Krishnan S, Reistetter TA. Stroke Survivor and Caregiver Perspectives on Post-Stroke Visual Concerns and Long-Term Consequences. Behav Neurol 2018; 4, 2018:1463429. DOI: 10.1155/2018/1463429. eCollection 2018.

34. Zhang SY, Liu SB, Wu W et al. Clinical Trials for Treatment of Stroke Patients with Dysphagia by Vitalstim Electroacupuncture Combined with Swallowing Rehabilitation Training. Zhen Ci Yan Jiu 2017; 42(2): 168-72.

35. Em S, Bozkurt M, Caglayan M et al. Psychological health of caregivers and association with functional status of stroke patients. Top Stroke Rehabil 2017; 24(5): 323-9.

Journal of Health Study and Medicine
2019, nr 2
ss. 77-96
DOI 10.36145/JHSM.2019.12

Nurses' Job Satisfaction – the Factor Structure of the Minnesota Satisfaction Questionnaire

Dariusz Walkowiak[1]
https://orcid.org/0000-0001-8874-2401

Rafał Staszewski[2]
https://orcid.org/0000-0001-9062-0737

[1] Department of Medical Law, Organization and Management in Health Care, Poznan University of Medical Sciences, Poznan, Poland
[2] Department of Hypertension, Angiology and Internal Medicine, Poznan University of Medical Sciences, Poznan, Poland

Address for correspondence:

Dariusz Walkowiak
Department of Medical Law, Organization and Management in Health Care Poznan
University of Medical Sciences, 39 Przybyszewskiego Str.
60-356 Poznan, Poland
e-mail: dariuszwalkowiak@ump.edu.pl

Abstract

Introduction: *There is a consensus that it is employees who have a decisive influence on the success of the organization in which they work. The problem of professional satisfaction of the personnel of health care system units, nurses in particular, seems to be one of the key issues. Of course, the most important is the amount of expenditure on the health service and the size of the contract with the National Health Fund (NFZ), but the managers of health care units have, at most, limited influence on them. Despite limited expenditure on health care, it is still possible to motivate employees and influence their satisfaction with their work.*

Materials and methods: *A study of job satisfaction among nurses has been conducted in two large public hospitals using the Minnesota Satisfaction Questionnaire (MSQ). Exploratory factor analysis (EFA) has been conducted.*

Results: *A total of 292 nurses completed the MSQ questionnaire (response rate 77.9%). Only questionnaires with all 20 questions answered have been analyzed (64.3% of all distributed). It seems that job satisfaction of nurses is influenced by four main factors. The first of the factors may be named "Satisfaction with supervision", the second –"Satisfaction with the consistence with self and chances of promotion", the third – "Satisfaction with remuneration and working conditions" and the fourth – "Satisfaction with usefulness and accomplishment".*

Conclusions: *Our results suggest that the job satisfaction of nurses from our study group cannot be measured as intrinsic and extrinsic satisfaction only. The results we obtained suggest that perhaps both intrinsic and extrinsic factors are more complex structures and seen in such a perspective will allow for better use in managing job satisfaction.*

Key words: *nurses*, job satisfaction, MSQ, exploratory factor analysis

Introduction

The Minnesota Satisfaction Questionnaire (MSQ) is a commonly used measure of job satisfaction, widely used in different industrial branches as well as in services. MSQ was developed "to make feasible to obtain a more individualized picture of worker satisfaction than it was possible using gross or more general measures of satisfaction with job as a whole. The individualized measurement is useful because two individuals may express the same amount of general satisfaction with their work but for entirely different reasons" [1]. The team working on MSQ constructed a questionnaire to be scored on three scales: intrinsic satisfaction, extrinsic satisfaction and general satisfaction. This division of satisfaction resulted from factor analysis carried out by Weiss and colleagues on the material gathered during studies on different professions, including nurses. Although MSQ was based on the theory of work adjustment [2, 3], later MSQ was usually considered to refer to Herzberg's two-factor (motivators and hygienes, M-H) theory [4]. Some researchers claim that Herzberg's theory influenced not only MSQ but also other measurement tools measuring worker satisfaction with both intrinsic and extrinsic factors [5, 6]. Empirical research conducted in various sectors has shown that factor loadings from MSQ scores strongly confirm Herzberg's theory of motivators and hygienes and were almost perfectly divided between intrinsic and extrinsic items proposed by Weiss and colleagues [7, 8, 9]. Nevertheless, some of the researchers using MSQ have claimed that the originally proposed subscales are confounded and therefore inadequate, with suggestions to change them [10]. Some found no important revision to be necessary [11].

In 2016 [12] Locke overviewed his own 1976 article in the Handbook of Industrial and Organizational Psychology [13] and wrote that Herzberg's theory was no longer considered valid, as both so-called M and H lead to satisfaction and dissatisfaction as well. Doubts arose decades earlier: as early as 1977 Gardner wrote "Results do not always support Herzberg; in fact, only about one in three do so. Donald Hebb once said that when it is a question of survival, theories are like women – fecundity

is more important than purity. M-H theory has certainly been very fertile – more so perhaps than any other theory in applied social psychology. Many industrial psychologists have not only survived but indeed thrived on the theory. The fecundity of the theory is not in doubt, but its purity certainly is highly suspect" [14].

The purpose of the present study has been to examine the factor structure of the MSQ for hospital nurses, and confirm or reject its two--factor (intrinsic and extrinsic) character.

Materials and methods

A study on job satisfaction among nurses was conducted in two large public hospitals in western Poland. During the study, 375 questionnaires were distributed among nurses in the hospital (all of them, except for those on long-term sick leave or holidays at the time of data collection), 292 of whom were completed. Participation in the study was fully voluntary. The study was conducted using the Minnesota Satisfaction Questionnaire (MSQ) in a shortened version (20 questions). The questionnaire was constructed on the basis of Likert's 5-point scale. MSQ was supplemented by short information about respondent, containing questions about gender, age and professional experience. The questionnaires were administered in such a way as to ensure full objectivity of the evaluations and complete anonymity when answering questions. The data collected in the questionnaires were verified and checked for completeness, quality and consistency. We received 241 questionnaires with all 20 questions answered, while in 51 questionnaires 1 or 2 answers were missing. Consequently, only the fully completed questionnaires were included in the study. They were then coded and analysed using the STATISTICA 12.5 statistical package (StatSoft Inc., Tulsa, USA). The Cronbach alpha coefficient for the variables forming the MSQ was 0.892, which indicates good internal consistency of scores from the total scale. Exploratory factor analysis (EFA) was conducted using FACTOR 10.5.03. An attempt to determine the number of dimensions with optimal implementation of Parallel Analysis (PA) was not fully satisfac-

tory. Polychoric correlations were used to determine dispersion matrix. Minimum Rank Factor Analysis (MRFA) was used for factor extraction. Principal axis factoring with oblique (direct Oblimin) and orthogonal (Varimax) rotation produced similar results when determining the underlying factor structure of the MSQ. Results from the Varimax rotation were reported for simplicity of interpretation. Raw Varimax was used for rotation to achieve factor simplicity and weighted Varimax was used for clever rotation starts.

Results

An analysis of the Mardia's multivariate asymmetry skewness and kurtosis was conducted. We computed the polychoric correlation matrix between 20 items from the MSQ. Polychoric correlation is advised when the univariate distributions of ordinal items are asymmetric or with excess of kurtosis. The results of comparisons show that the solutions obtained using polychoric correlations provide a more accurate reproduction of the measurement model used to generate the data than using Pearson correlation [15, 16]. Standardized variance matrix was calculated using polychoric algorithm (Bayes modal estimation). Then adequacy of the polychoric correlation matrix was checked and KMO value was 0.869 (meritorious), which indicated that the items were meaningful to be factorised. The Bartlett test of sphericity was significant (p=0.00001), which indicated correlation among the items [17].

Then parallel analysis (PA) based on minimum rank factor analysis was conducted and eigenvalues of the reduced correlation matrix were calculated. Random correlation matrices were obtained using permutation of the raw data. PA is based on comparing each eigenvalue to random eigenvalues: the aim is to retain only those factors which are related to an amount of variance larger than the amount of variance of random factors. The results suggested a one factor structure. The Keyser criterion (eigenvalue over 1.00) suggested a five-factor structure. Since the fifth factor contained only one loading, also this hypothesis was rejected. Finally, a four-factor solution was obtained (see table 2 and table 3).

Root Mean Square of Residuals (RMSR) = 0.0561. Expected mean value of RMSR for an acceptable model = 0.0645 (Kelley's criterion). RMSR represents a quantitative index which describes the average size of residual correlations once predicted response frequencies have been fitted to correspond with observed response frequencies.

Table 1. Explained variance based on eigenvalues

Variable	Eigenvalue	Proportion of variance	Cumulative proportion of variance
1	7.81999	0.39100	0.39100
2	1.66363	0.08318	0.47418
3	1.30762	0.06538	0.53956
4	1.18481	0.05924	0.59880
5	1.04000	0.05200	0.65080
6	0.95141	0.04757	
7	0.79888	0.03994	
8	0.75413	0.03771	
9	0.65228	0.03261	
10	0.59818	0.02991	
11	0.51809	0.02590	
12	0.47161	0.02358	
13	0.42140	0.02107	
14	0.40678	0.02034	
15	0.33565	0.01678	
16	0.30739	0.01537	
17	0.26816	0.01341	
18	0.23304	0.01165	
19	0.16104	0.00805	
20	0.10591	0.00530	

Table 2. Unrotated loading matrix

Variable	F 1	F 2	F 3	F 4	Communality
1	0.648	0.271	-0.063	-0.367	0.788
2	0.682	0.281	0.204	-0.107	1.000
3	0.686	0.383	0.055	-0.154	0.725
4	0.690	0.224	-0.047	-0.045	0.777
5	0.658	-0.272	-0.444	-0.143	0.833
6	0.646	-0.406	-0.364	-0.265	0.890
7	0.593	0.125	0.055	0.318	0.701
8	0.366	0.041	0.149	0.130	0.490
9	0.561	0.333	0.317	-0.298	1.000
10	0.419	0.203	-0.049	0.426	0.551
11	0.756	0.288	0.023	0.104	0.878
12	0.696	-0.350	0.126	-0.123	0.959
13	0.395	-0.618	0.585	-0.067	1.000
14	0.704	-0.002	0.094	0.138	0.588
15	0.718	-0.083	-0.299	0.235	0.933
16	0.634	-0.050	-0.036	0.336	0.739
17	0.484	-0.365	0.291	0.187	0.633
18	0.468	-0.056	-0.162	0.063	0.577
19	0.650	-0.182	-0.254	-0.062	1.000
20	0.694	-0.029	0.163	-0.086	0.872

Table 3. Rotated loading matrix (loadings lower than absolute 0.4 omitted)

Variable	F 1	F 2	F 3	F 4
1				0.699
2				0.693
3				0.735
4				0.567
5	0.811			
6	0.843			
7		0.568		
8				
9				0.760
10		0.599		
11		0.484		0.604
12	0.484		0.537	
13			0.931	
14		0.443		0.401
15	0.565	0.545		
16		0.583		
17			0.589	
18				
19	0.620			
20				0.491

Discussion

This study provides insights into some of the factors that have an important effect in explaining the variation in describing job satisfaction of nurses in Poland. It seems that job satisfaction of nurses is influenced by four main factors. In each of them 3 to 8 variables are included. The first of the factors may be named "Satisfaction with supervision", the second – "Satisfaction with the consistence with self and chances of promotion", the third –"Satisfaction with remuneration and working conditions" and the fourth –"Satisfaction with usefulness and accomplishment." Our results did not confirm the factor structure of MSQ proposed by Weiss and colleagues

[1], neither the follow-up developed by Schriesheim et al. [10]. Reviewing works on the subject of MSQ factor structure we found major differences among them. Koelbel et al. [8] obtained a two-factor structure in the group of 132 nurse practitioners and midwives, and found results to be consistent with the predictions of Herzberg's theory: intrinsic factors served as sources of job satisfaction, while extrinsic factors were the primary source of job dissatisfaction. In 1994 in her doctoral thesis [7] Kem confirmed three factors in MSQ in a group of 202 academic librarians in Florida. Tan and Hawkins [4] obtained three factors in the group of 87 participants of vocational rehabilitation. In 2004 Hancer and George [18] identified a four-factor structure in the group of 924 restaurant employees. In a group of 136 participants Ferreira [19] identified two factors. Similarly, a two-factor structure was found by Martins and Proença in the group of 140 hospital workers in Portugal [20]. Ingram and Głód obtained five factors in the group of 75 hospital workers in Poland [21]. Buitendach and Rothman found a two-factor structure in the group of 474 industrial employees in South Africa [22]. Frye obtained a four-factor structure in the group of 135 American hotel front office managers [23]. BegümÖtken and Okan identified a three-factor structure among 399 blue collar workers in Turkey [24]. Issa obtained a six-factor structure among 325 Jordanian hospital employees [25].

Naturally, at least some of these differences can be explained on the basis of contemporary knowledge. Job satisfaction levels have not been found to be the same in different countries [26, 27]. As Argyle concludes in his book about psychology of happiness [28], in prosperous countries '[m]aking individuals or countries richer has very little effect on their subjective well-being'. Because factor structure was studied in different countries, some part of the differences in the results may be traced to differences in the collective mental programming of people in one country that made them distinct from the people from other countries [29]. This can be expressed in employee motivation, management style, and organizational structures of companies, which finally may influence job satisfaction [30]. We should also consider another explanation for the

differences observed by various researchers: at upper levels of organisations, satisfaction and performance may be manifested differently than at lower levels [31]. A decrease in job satisfaction in consecutive years has also been described for various countries [32, 33].

It seems that difficulties in standardising the factor structure of job satisfaction in health care might be due to various additional circumstances. Mottaz suggested that "the level of work satisfaction among nurses tends to be somewhat lower than levels found in other professional occupationsgroups" [34]. Czerw and Borkowska writing about professions with a social mission speculated that work commitment largely determines job satisfaction, as well as work performance and satisfaction with the decision to choose such a profession [35]. Research conducted by Tellez on California nurses [36] suggests that influence of important improvements in the working conditions of nurses, such as increasing nurse-to-patient ratios, significantly increased nurse job satisfaction only in the mid-term, post-implementation period, whereas long-term effects were less clearly characterized. A major job satisfaction gap was observed between private and public healthcare sector employees. Differences were found not only in salaries [37, 38, 39]. Marković and colleagues found significant differences in job satisfaction between healthcare personnel working on primary level and working on secondary and tertiary level – not only in general results but also on the subscales characterizing different aspects of job [40]. Aiken et al. found major differences in job satisfaction among nurses in 12 European countries [41]. Therefore, considering circumstances mentioned above, any research on job satisfaction of nurses may result in a different picture of job satisfaction.

There is no one proper procedure for the appropriate use of EFA, or no clear recommendations on how to reach a decision during conducting EFA. Moreover, some of the recommendations seem to be contradictory with others. However, we would like to emphasize the importance of some of them. First, as Howard [42] wrote, analysing the EFA conducted by various researchers, "a surprising number of authors did not even mention their factor analytic method, and only stated that they perfor-

med 'factor analysis'. This is extremely problematic, as readers cannot be certain of the validity of results and replication becomes impossible." Second, the sample size and the number of variables selected when conducting EFA was widely discussed [43, 44, 45]. There is no sample size limit to conduct EFA, because the demands are modulated by the communalities of the variables, the correlations among factors, and the number of variables that define each factor [46]. However, most authors agree that in some circumstances too small sample size may lead to inadequate constitution of the scale. Third, the level of the total item variance that is explained is important. Too low level of explained variance may lead to significant measurement error, with important part of variance not explained. Nunnally and Bernstein [47] stated that "initial factors are usually difficult to interpret; the goal [of a FA] is to explain the most variance (or related property) with the smallest number of factors." Finally, it is not recommended as a basic rule to retain factors with eigenvalues higher than 1 (Kaiser's rule), as it is usually recommended to retain an excessive number of factors [48]. It seems that in some of MSQ factor analyses mentioned above, these recommendations were not fully followed and probably not all MSQ factor analyses may be compared.

An analysis of our four-factor dimension structure led us to propose a two-factor solution, in which each of the two factors (intrinsic satisfaction – I and extrinsic satisfaction – E) consists of two out of four factors obtained in factor analysis (see table 4). Factor E consists of F1 and F3 (see table 3), and factor I – of F2 and F4.

The results of our two-factor structure shown above gave results similar to those received directly as two-factor by Weiss et al. [1] and also by Schriesheim et al. [10]. It is worth mentioning that we also tested in our loading matrix a two-factor structure; however, the RMSR of the two-factor structure was higher (0.0761) than the expected mean value of RMSR for an acceptable model. As RMSR was larger than Kelley's criterion value, the direct two factor model cannot be considered as good. Although the results obtained using this method gave a structure similar to the original extrinsic/intrinsic/general job satisfaction, it is worth men-

tioning that the two-step procedure with four factor extraction matches better the original Weiss structure. However, it seems that a four-factor structure finally may fit MSQ model better and probably better describes job satisfaction in our study group.

Problems with duplicating original factor structure are quite common in job satisfaction research. McCloskey/Mueller Satisfaction Scale (MMSS) was originally developed for use with hospital staff nurses and planned as eightfactors [49]. Tourangeau et al. [50] were unable to replicate original eight factors using confirmatory factor analysis and finally obtained 7 factors using EFA. Lee et al. [51] came to a 5-factor solution. In the Czech Republic Gurkova et al. [52] obtained a 6-factor solution. In Slovenia Prosen and Piskar [53] found 7 factors in the conducted MMSS. It may also be that the FA of job satisfaction leads to different results depending on a whole range of factors within and outside the organization. And the results obtained may differ from each other.

Conclusion

Our results suggest that the job satisfaction of nurses from our study group cannot be measured as intrinsic and extrinsic satisfaction only. Job satisfaction seems to include four factors; arriving at a two-factor structure is possible, but only as a result of combining factors obtained in EFA. The results we obtained suggest that perhaps both intrinsic and extrinsic factors are more complex structures and seen in such a perspective will allow for better use in managing job satisfaction.

Table 4. Two factor MSQ structure compared with Weiss and Schriesheim structures

Variable	Our results	MSQ Weiss [1]	MSQ Schrie-sheim [10]
1. Being able to keep busy all the time.	I	I	I
2. The chance to work alone on the job.	I	I	I
3. The chance to do different things from time to time.	I	I	I
4. The chance to be "somebody" in the community.	I	I	G
5. The way my boss handles his/her workers.	E	E	E
6. The competence of my supervisor in making decisions.	E	E	E
7. Being able to do things that don't go against my conscience.	I	I	I
8. The way my job provides for steady employment.	(I)	I	E
9. The chance to do things for other people.	I	I	I
10. The chance to tell people what to do.	I	I	I
11. The chance to do something that makes use of my abilities.	I	I	I
12. The way company policies are put into practice.	E	E	E
13. My pay and the amount of work I do.	E	E	G
14. The chances for advancement on this job.	I	E	G
15. The freedom to use my own judgement.	I/E	I	I
16. The chance to try my own methods of doing the job.	I	I	I
17. The working conditions.	E	G	E
18. The way my co-workers get along with each other.	(E)	G	E
19. The praise I get for doing a good job.	E	E	G
20. The feeling of accomplishment I get from the job.	I	I	I

Values in parentheses show the highest loading for each factor between 0.3 and 0.4. In the case when two factors have the loading higher than 0.3, two factors are given, separated by a slash, with the higher-loading factor first.

References

1. Weiss DJ, Dawis RV, England GW, Lofquist LH. Manual for the Minnesota Satisfaction Questionnaire. Minneapolis: University of Minnesota, Industrial Relations Center; 1967.

2. Dawis RV, England G, Lofquist LH. A theory of work adjustment (Minnesota studies in vocational rehabilitation: XV, under support of the U.S. Department of Health, Education, and Welfare). Minneapolis: University of Minnesota, Industrial Relations Center; 1964.

3. Dawis RV, Lofquist LH, Weiss DJ. A theory of work adjustment (a revision). Minnesota studies in vocational rehabilitation: XXIII. Minneapolis: University of Minnesota, Industrial Relations Center; 1968.

4. Tan PP, Hawkins WE. The factor structure of the Minnesota Satisfaction Questionnaire and participants of vocational rehabilitation. Psychol Rep 2000; 87: 34-6.

5. Owler KJ, Morrison RL. What makes work enjoyable and motivating for Learning Advisors in Aotearoa – New Zealand? The Association of Tertiary Learning Advisors Aotearoa/New Zealand (ATLAANZ) 2015; 1.

6. Ncube CM, Samue MO. Revisiting employee motivation and job satisfaction within the context of an emerging economy: Theoretical representation and developing the model. Mediterranean Journal of Social Sciences 2014; 5: 267-282.

7. Kem CR. The relationship between Herzberg's motivator/hygiene theory and work behavior types of academic librarians in Florida. Thesis (Ph. D.) – University of Florida, 1994.

8. Koelbel PW, Fuller SG, Misener TR. Job satisfaction of nurse practitioners: an analysis using Herzberg's theory. Nurse Pract 1991; 16: 43, 46-52, 55-6.

9. Baaren T, Galloway C. Consequence of Job Satisfaction Factors on the Productivity Level of Operating Core. Journal of Organizational Psychology and Consumer Behavior, 2014; 14: 119-127.

10. Schriesheim CA, Powers KJ, Scandura TA, Gardiner CC, Lankau MJ. Improving Construct Measurement in Management Research: Comments and a Quantitative Approach for Assessing the Theoretical Content Adequacy of Paper-and-Pencil Survey-Type Instruments. Journal of Management 1993; 19: 385-417.

11. Hirschfeld RR. Does revising the intrinsic and extrinsic subscales of the Minnesota Satisfaction Questionnaire short form make a difference? Educational and Psychological Measurement 2000; 60: 255-270.

12. Locke EA. The nature and causes of job satisfaction. In: Dunnette MD. ed. Handbook of Industrial and Organizational Psychology. Chicago: Rand McNally College Publishing Company; 1976. pp. 1297-1349.

13. Locke EA. Job Satisfaction: Overview [Internet]. 2016 [cited 2019 June 10]. Available from: www.researchgate.net.

14. Gardner G. Is there a valid test of Herzberg's two-factor theory? Journal of Occupational Psychology 1977; 50: 197-204.

15. Holgado-Tello FP, Chacón-Moscoso S, Barbero-García I, Vila-Abad E. Polychoric versus Pearson correlations in exploratory and confirmatory factor analysis of ordinal variables. Quality & Quantity 2008; 44: 153-166.

16. Baglin J. Improving your exploratory factor analysis for ordinal data: a demonstration using FACTOR. Practical Assessment, Research & Evaluation [Internet] 2014; 19(5) [cited 2019 June 10]. Available from: http://pareonline.net/getvn.asp?v=19&n=5.

17. Sheskin DJ. Handbook of parametric and nonparametric statistical procedures, 4th edition. Chapman and Hall/CRC; 2007.

18. Hancer M, George RT. Factor structure of the Minnesota Satisfaction Questionnaire short form for restaurant employees. Psychol Rep 2004; 94: 357-62.

19. Ferreira JA, Fernandes R, Haase RF, Santos ER. Minnesota Satisfaction Questionnaire – Short Form: Estudo de Adaptação e Validação Para a População Portuguesa. Psychologica 2009; 51: 251-81.

20. Martins H. Proenca T. Minnesota Satisfaction Questionnaire – Psychometric Properties and Validation in a Population of Portuguese Hospital Workers. FEP Working Papers, University of Porto [Internet]. 2012 [cited 2019 June 10]. Available from http://wps.fep.up.pt/wps/wp471.pdf.

21. Ingram T, Głód W. Wykorzystanie MSQ jako narzędzia badania satysfakcji z pracy w wybranej jednostce ochrony zdrowia. Nauki o Zarządzaniu, Management Sciences 2014; 3: 31-43.

22. Buitendach JH, Rothmann S. The validation of the Minnesota Job Satisfaction Questionnaire in selected organisations in South Africa. SA Journal of Human Resource Management/ SA Tydskrif vir Menslikehulpbronbestuur 2009; 7: 183.

23. Frye WD. An Examination of Job Satisfaction of Hotel Front Office Managers According to Extrinsic, Intrinsic, and General Motivational Factors. International Journal of Business and Social Science 2012; 3: 40-52.

24. Begüm Ötken A, Okan EY. A Study of the Relationship between Job Satisfaction and Happiness for the Blue-Collar Workers in Turkey. Proceedings of 36th International Business Research Conference 14-16 July 2016. Ryerson University, Toronto, Canada.

25. Issa MT. Highlighting the main factors of job satisfaction among Jordanian hospital employees. Journal of Applied Quantitative Methods 2016; 11: 80-88.

26. Spector PE. Industrial and organisational psychology: Research and Practice, 4th Edition. New York: John Wiley&Sons, Inc.; 2006.

27. Pichler F, Wallace C. What are the Reasons for Differences in Job Satisfaction across Europe? Individual, Compositional, and Institutional Explanations. European Sociological Review 2009; 25: 535-549.

28. Argyle M. The Psychology of Happiness, 2nd Edition. London: Routledge; 2001.

29. Hofstede G, Hofstede GJ, Minkov M. Cultures and Organizations: Software of the Mind, Third Edition. New York: McGraw-Hill; 2010.

30. Andreassi JK, Lawter L, Brockerhoff M, Rutigliano, P. (2012). Job satisfaction determinants: A study across 48 nations. Business Faculty Publications, Paper 220. Retrieved on April 24, 2014.

31. Bruce WM, Blackburn JW. Balancing Job Satisfaction and Performance: A Guide for Human Resource Professionals. Westport, Connecticut, London: Quorum Books; 1992.

32. Hamermesh DS. The changing distribution of job satisfaction. Journal of Human Resources 2001; 36: 1-30.

33. Green F, Tsitsianis N. An investigation of national trends in job satisfaction in Britain and Germany. British Journal of Industrial Relations 2005; 43(3): 401-429.

34. Mottaz CJ. Work satisfaction among hospital nurses. Hospital & Health Services Administration 1988; 33: 57-74.

35. Czerw A, Borkowska A. Praca zawodowa jako obszar realizowania misji społecznej. Psychologia Społeczna 2010; 4: 303-315.

36. Tellez M. Work Satisfaction Among California Registered Nurses: A Longitudinal Comparative Analysis. Nursing Economics 2012; 30: 73-81.

37. Ostrowicka M, Walewska-Zielecka B, Olejniczak D. Czynniki motywujące i satysfakcja z pracy pielęgniarek w wybranych placówkach publicznej i prywatnej służby zdrowia. Zdrowie Publiczne i Zarządzanie 2013; 11: 191-209.

38. Rojas D, Seghieri C, Nuti S. Organizational climate: Comparing private and public hospitals within professional roles. Suma Neg 2014; 5: 10-14.

39. Barhem B, Younies H, Younis M. Employee Satisfaction in the Health Care Sector: A Comparative Study of Private and Public Health Care Organisations in the UAE. Journal of Health Management 2010; 12: 19-38.

40. Marković RT, Ilić MD, Milosević Z, Vasić M, Bogdanović D, Sagrić C. Procena zadovoljstva zaposlenih u zdravstvenim ustanovama Nišavskog i Topličkog okruga poslom koji obavljaju. Med Pregl 2013; 66: 379-85.

41. Aiken LH, Sloane DM, Bruyneel L, Van den Heede K, Sermeus W. Nurses' reports of working conditions and hospital quality of care in 12 countries in Europe. International Journal of Nursing Studies 2013; 50: 143-153.

42. Howard MC. A Review of Exploratory Factor Analysis Decisions and Overview of Current Practices: What We Are Doing and How Can We Improve? Intl. Journal of Human-Computer Interaction 2016; 32: 51-62.

43. MacCallum RC, Widaman KF, Preacher KJ, Hong S. Sample Size in Factor Analysis: The Role of Model Error. Multivariate Behav Res 2001; 1: 611-37.

44. Pearson RH, Mundform DJ. Recommended Sample Size for Conducting Exploratory Factor Analysis on Dichotomous Data. Journal of Modern Applied Statistical Methods 2010; 9: 359-368.

45. Henson RK, Roberts JK. A Meta-analytic Review of Exploratory Factor Analysis Reporting Practices in Published Research. Paper presented at the annual meeting of the Southwest Educational Research Association. New Orleans; February, 3, 2001.

46. Izquierdo I, Olea J, Abad FJ. Exploratory factor analysis in validation studies: Uses and recommendations. Psicothema 2014; 26: 395-400.

47. Nunnally JC, Bernstein IH. Psychometric Theory. New York: McGraw-Hill; 1994.

48. Yang Y, Xia Y. On the number of factors to retain in exploratory factor analysis for ordered categorical data. Behav Res Methods 2015; 47: 756-72.

49. Mueller CW, McCloskey JC. Nurses' job satisfaction: a proposed measure. Nurs Res 1990; 39: 113-7.

50. Tourangeau AE, McGillis Hall L, Doran DM, Petch T. Measurement of nurse job satisfaction using the McCloskey/Mueller Satisfaction Scale. Nurs Res 2006; 55: 128-36.

51. Lee SE, Dahinten SV, MacPhee M. Psychometric evaluation of the McCloskey/Mueller Satisfaction Scale. Jpn J Nurs Sci 2016; 13: 487-495.

52. Gurková E, Haroková S, Žiaková K. Psychometrické vlastnosti české verze nástroje pracovní spokojenosti-McCloskey/Mueller satisfaction scale. Ošetřovatelství a porodní asistence 2012; 3: 375-383.

53. Prosen M, Piskar F. Job satisfaction of Slovenian hospital nursing workforce. Journal of Nursing Management 2015; 23: 242-251.

Journal of Health Study and Medicine
2019, nr 2
ss. 97-121
DOI 10.36145/JHSM.2019.13

Knowledge of Patient's Rights among Students of the Faculty of Health Sciences of the Medical University of Łódź

Dominika Cichońska-Rzeźnicka[1]

Paulina Trojak[2]

[1] Department of Social Medicine, Medical University of Lodz, Poland

[2] Specialist Hospital for Tuberculosis, Lung Diseases and Rehabilitation, Tuszyn, Poland

Address for correspondence

Dominika Cichońska-Rzeźnicka
Department of Social Medicine
Medical University of Lodz
7/9 Żeligowskiego Str., 90-752 Lodz, Poland
e-mail: dominika.cichonska@umed.lodz.pl

Abstract

Introduction: *Patient's rights are a set of rights one is entitled to, regulated by the entirety of regulations, for the use of health and medical services. These are objective standards informing about what the patient can expect from entities directly providing health services and the auxiliary institutions.*

Aim: *The study analyses the knowledge of patient's rights among students of selected fields of study at the Faculty of Health Sciences of the Medical University of Lodz.*

Material and methods: *The study of knowledge of patient's rights was conducted among the students of the Faculty of Health Sciences using the diagnostic survey method in the period from January to March 2019. The author's questionnaire was used as a research tool. 309 students participated in the survey.*

Results: *The inference was based on strong Chi-Square and ANOVA tests. Conclusions from the analyses – the field of study has no impact on the level of knowledge about patient's rights, the largest percentage of students of all fields gave a subjective answer about very good knowledge of the subject of patient's rights, sources of knowledge regarding patient's rights are different for selected fields of study, students' knowledge about patient's rights does not depends on the year of study of the respondents.*

Conclusions: *There is an urgent need to distinguish a subject on patient's rights from the subjects taught at the Faculty of Health Sciences and the need to consider the possibility of expanding the number of lectures devoted to patient's rights in the vocational training program for doctors and other healthcare professionals, and introduce opportunities for professional development of knowledge about patient's rights within organised forms of postgraduate education.*

Key words: *patient, patient's rights, medical staff, hospital, health services*

Introduction

In Polish law patient's rights are an important chapter and their protection as the equal participant of the healthcare system gains importance [1]. From a historical perspective, the evolution of concepts and notions of patient's rights covers the period from the 4th century B.C. until the beginning of the 21st century. In fact, the beginnings of these considerations date back to the moment of the emergence of European medicine, i.e. from the announcement of the Hippocratic oath, to modern times [2]. Patient's rights are in line with the implementation of art. 68 of the Polish Constitution – the right to health protection. Their goal is to provide the patient with maximum safety and comfort in the treatment process [3].

The catalogue of patient's rights was regulated in detail by the provisions of the Act of November 6, 2008 on patient's rights and the Patient's Ombudsman, which covers the patient's right to health services, the patient's right to information, the patient's right to confidential information related to them, the right to consent to the provision of health services, the right to confidentiality of the health condition, the patient's right to privacy and dignity, the right to medical documentation, the patient's right to object to a doctor's opinion or decision, the patient's right to respect for private and family life, etc. [4,5]. The Act did not only set the catalogue of patient's rights, but also established the Patient's Ombudsman competent in matters of protection of these rights [6, 7].

All entities participating in the provision of health services, i.e. persons practising the medical profession, persons participating in the process of providing health services or the National Health Fund are obliged to comply with the patient's rights. The legislator has guaranteed the possibility of applying for pecuniary compensation in court to the citizen who considers that their rights as a patient have been violated.

The annual reports of the Patient's Ombudsman regarding the observation of patient's rights in the territory of the Republic of Poland report a worrying phenomenon of a continuous increase not only of reported violations of patient's rights, but above all an increase in the number of detected violations of these rights [8]. The basic solution for changing the

alarming statistics is the knowledge of patient's rights and the ability to apply them in practice in everyday work by all healthcare professionals. Therefore, the purpose of the presented study was to assess the knowledge of patient's rights and the principles of their application in practice by the future healthcare workers, i.e. students of the Faculty of Health Sciences of the Medical University of Lodz.

Material and methods

The study of knowledge of patient's rights was conducted among the students of the Faculty of Health Sciences using the diagnostic survey method in the period from January to March 2019. The author's questionnaire was used as a research tool, distributed to all students of the fields of nursing, obstetrics, public health and dietetics.

The survey questionnaire consisted of 15 multiple choice questions divided into two parts: the first regarded the student's subjective assessment of knowledge of patient's rights, the second provided the objective assessment of the knowledge of patient's rights among students of nursing, obstetrics, dietetics and public health.

The survey guaranteed full anonymity of respondents and voluntary participation in the project.

As part of the study, three main research questions were asked:

1. Does student knowledge about patient's rights differ depending on the field of study?
2. Do sources of knowledge about patient's rights used by students differ depending on the field of study?
3. Does student knowledge about patient's rights depend on the year of study of the respondents?

All variables used in the performed statistical analysis were expressed in ordinal and quantitative scales. The inference was based on strong Chi-Square and ANOVA tests.

Results

309 students in the fields of public health, dietetics, nursing and obstetrics participated in the study. The majority of respondents were women (86% of all respondents). Female groups dominated in each group representing each field of study.

Each of the fields of study was divided according to the year of study: first year students (76 people), second (67 people), third (66 people), fourth – first year of complementary studies (50 people) and fifth year – second year of complementary studies (55 people). The group characteristics are summarised in Table 1. It is worth noting that the field of study and year groups are different, which may affect the results of further analyses.

In the first analysis, the relationship between knowledge about patient's rights and the field of study of the respondents was checked. Statistical assessment is based on the subjective answers of the respondents regarding the assessment of patient's rights. Respondents' answers are summed up in Table 2.

The highest percentage of respondents who highly assess their knowledge of patient's rights study public health (69.89% of public health students surveyed replied that they know patient's rights very well). 21.92% of students of this faculty said they knew the subject, but without any details. Among the students of dietetics, 55.41% of respondents answered that they knew the subject very well. Over 65% of surveyed nursing and obstetrics students claimed a very good knowledge of the researched subject. What is interesting, 16.22 students of dietetics admitted to not knowing patient's rights. The remaining respondents from all fields of study claim that they know patient's rights, but without details. Students of all faculties answered very similarly. This is also confirmed by the performed chi-square test, which indicated a probability coefficient of 0.21, and negatively verifies the impact of the field of study on the knowledge of patient's rights. The test results are shown in Table 3 and Diagram 1.

Table 1. Characteristics of the research group

Year of study	I		II		III		IV		V		Sum	Sum	
Gender	K	M	K	M	K	M	K	M	K	M		K	M
Public health	13	2	10	3	14	2	12	1	12	3	72	61	11
Dietetics	13	6	9	7	10	5	11	2	10	1	74	53	21
Nursing	20	2	18	1	15	2	12	0	13	0	83	78	5
Obstetrics	19	1	17	2	11	2	12	0	15	1	80	74	6
Sum	65	11	54	13	50	11	47	3	50	5	309	266	43

Table 2. Cardinality table for variables: knowledge of patient's rights, field of study

	Cardinality table					
	Field of study	**Knowledge of Patient's Rights I don't know anything, I don't know my rights**	**Knowledge of Patient's Rights I know there are rights but I don't know them**	**Knowledge of Patient's Rights I know patient's rights but without details**	**Knowledge of Patient's Rights I know patient's rights very well**	**Total**
Number	Public health	1	5	16	51	73
% of the column		0%.	17.24%.	18.60%.	26.15%.	
% of the row		1.37%.	6.85%.	21.92%.	69.86%.	
% of total		0.32%.	1.61%.	5.14%.	16.405	23.47%.
Number	Dietetics	0	12	21	41	74
% of the column		0%.	41.38%.	24.42%.	21.03%.	
% of the row		0%.	16.22%.	28.38%.	55.41%.	
% of total		0%.	3.86%.	6.75%.	13.18%.	23.79%.
Number	Nursing	0	4	25	55	84
% of the column		0%.	13.79%.	29.07%.	28.21%.	
% of the row		0%.	4.76%.	29.76%.	65.48%.	
% of total		0%.	1.29%.	8.04%.	17.68%.	27.01%.
Number	Obstetrics	0	8	24	48	80
% of the column		0%.	27.59%.	27.91%.	24.62%.	
% of the row		0%.	10.00%.	30.00%.	60.00%.	
% of total		0%.	2.57%.	7.72%.	15.43%.	
Number	Total	1	29	86	195	311
% of total		0.32%.	9.32%.	27.65%.	62.70%.	

Table 3. Chi-Square test results for variables: knowledge of patient's rights, field of study

	Field of study x Knowledge of patient's rights		
Statistics	Chi-square	df	p
Pearson's Chi2	12.02201	df=9	p=,21207
NW Chi2	11.49806	df=9	p=,24311
Fi	.1966113		
Contingency Coefficient	.1929179		
Cramer's V	.1135136		

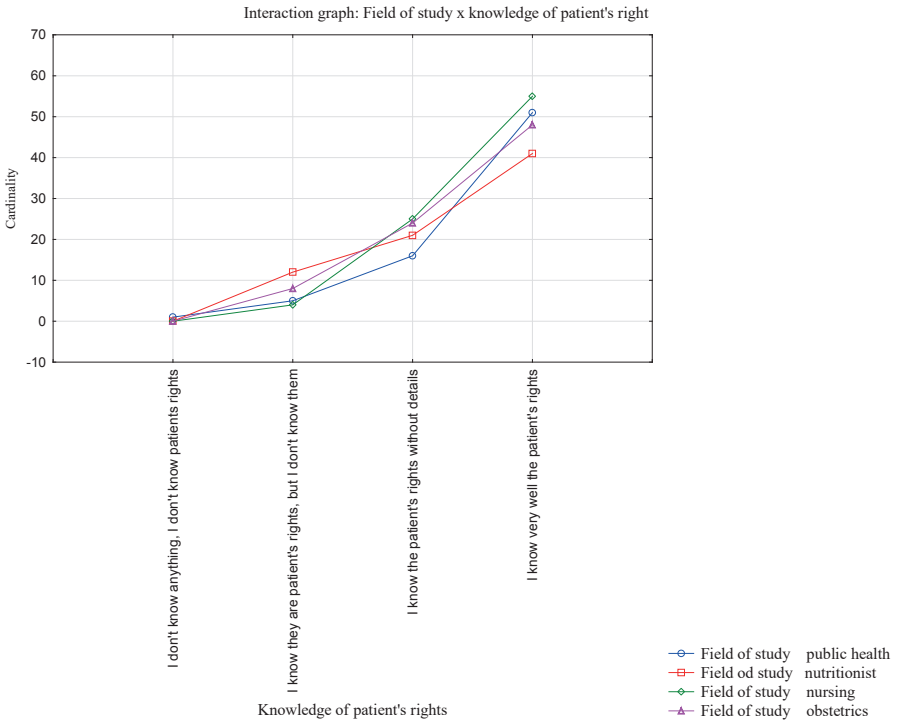


Diagram 1. Interaction diagram for variables: field of study, knowledge of patient rights

The next analysis regarded the sources of knowledge about patient's rights – table 4.

Every fifth student of public health is not able to specify the source of their knowledge. The same number believes that they learned the most while hospitalised, and more than a half mention other sources of their knowledge. 28% of students of dietetics indicated hospitalisation, and 61% mention sources other than those listed in the survey, including classes at the Medical University of Lodz. Students of nursing more often than other groups indicated the answer regarding knowledge acquired in the clinic. This answer was indicated by 24% of respondents in this group. Obstetrics students, like most students of other fields of study, in the largest number decided to indicate other sources of knowledge, including classes at the Medical University of Lodz. Every fourth respondent is unable to accurately indicate the source of information on patient's rights.

The chi-square test showed no relationship between the field of study and the source of students' knowledge about patient's rights – Table 5.

The largest spread of responses was among students of dietetics. At the same time, they were the only ones who did not answer that they did not know the sources of their knowledge about the patient's rights – Diagram 2.

The third analysis regarded the comparison of knowledge of patient's rights based on the correctness of the survey responses of students of various years of study. The correct student responses were analysed. The percentage results are presented in Table 6 and Table 7.

Table 4. Cardinality table for variables: field of study, source of information

		Cardinality table					
	Field of study	**Source of information** clinic	**Source of information** press, TV, friends, family	**Source of information** hospitalisation	**Source of information** I've heard somewhere, but I don't know much about them	**Source of information** Other situations	**Total**
Number	Public health	8	2	14	15	34	73
% of the column		19%.	22%.	31%.	28%.	21%.	
% of the row		11%.	3%.	19%.	21%.	47%.	
% of total		3%.	1%.	5%.	5%.	11%.	24%.
Number	Dietetics	8	0	21	0	45	74
% of the column		19%.	0%.	47%.	0%.	28%.	
% of the row		11%.	0%.	28%.	0%.	61%.	
% of total		3%.	0%.	7%.	0%.	15%.	24%.
Number	Nursing	20	0	5	19	39	83
% of the column		48%.	0%.	11%.	36%.	24%.	
% of the row		24%.	0%.	6%.	23%.	47%.	
% of total		6%.	0%.	2%.	6%.	13%.	27%.
Number	Obstetrics	6	7	5	19	43	80
% of the column		14%.	78%.	11%.	36%.	27%.	
% of the row		8%.	9%.	6%.	24%.	54%.	
% of total		2%.	2%.	2%.	6%.	14%.	26%.
Number	Total	42	9	45	53	161	310
% of total		14%.	3%.	15%.	17%.	52%.	

Table 5. Chi-Square test results for variables: field of study, source of information

	Field of study x source of information		
Statistics	Chi-square	df	p
Pearson's Chi2	61.33914	df=12	p=,00000
NW Chi2	73.90945	df=12	p=,00000
Fi	.4448238		
Contingency Coefficient	.4064279		
Cramer's V	.2568191		

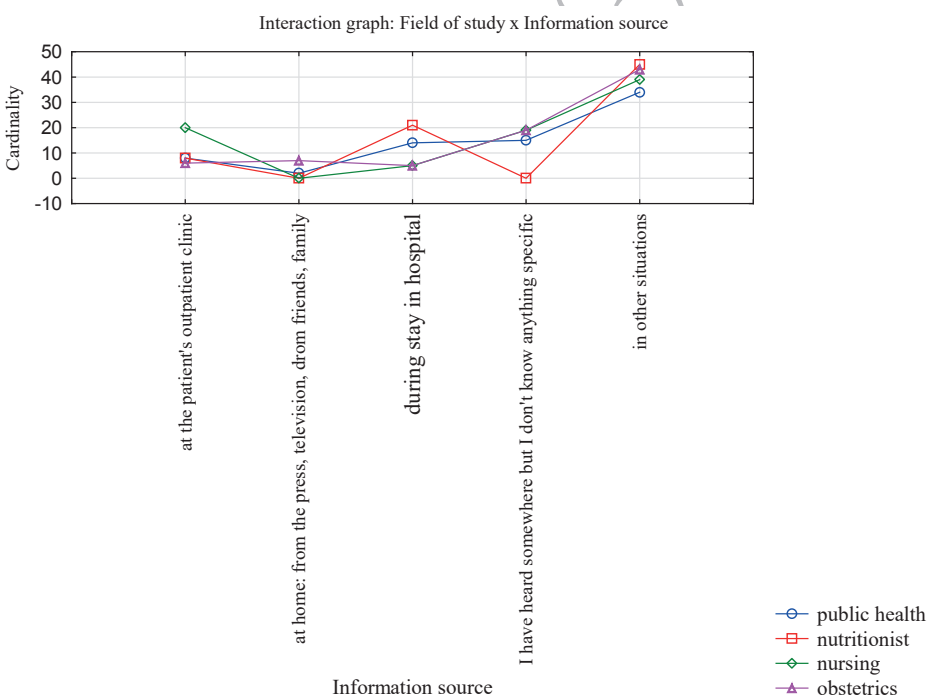


Diagram 2. Interaction drawing for variables: field of study, source of informations

Table 6. Comparison of the percentage of correctness of answers for respondents from various years of study

Question No./Year of study	I	II	III	IV	V
	Correctness of answer [%]				
5	49.59	63.39	57.98	74.10	59.44
6	63.81	46.13	59.37	65.64	60.44
7	37.03	59.18	61.61	63.97	61.39
8	88.26	70.02	76.54	65.38	80.86
9	78.62	60.91	73.68	45.51	48.13
10	75.26	72.01	74.38	60.64	85.08
11	77.20	82.65	77.93	75.38	74.22
12	70.27	84.28	77.77	62.18	69.07
13	77.30	77.25	72.50	72.56	78.66
14	64.75	63.33	62.93	66.19	53.73

Table 7. Fourfold table for variables: year of study, percentage of positive answers

Year of study	Fourfold table for N=50 descriptive statistics		
	Percentage of positive answers Average.	Percentage of positive answers Valid	Percentage of positive answers Stand. Dev.
I	68.20873	10	15.19382
II	67.91369	10	11.71288
III	69.46881	10	8.02750
IV (I MA comp.)	65.15769	10	8.54663
V (II MA comp.)	67.10365	10	12.36136
Total	67.57051	50	11.09024

Table 8. ANOVA result for variables: year of study and percentage correctness of answers

Variable	Variance analysis The marked effects are significant at p <0.5							
	SS Effect	df Effect	MS Effect	SS Error	df Error	MS Error	F	P
Percentage of positive answers	101.683	0 4	25.4207	5 5924,99	1 45	131.666	5 0,19306	9 0,94077

The data met the assumptions of normality of distribution and uniformity of variance. The ANOVA test showed a probability coefficient of p = 0.94, thus confirming the absence of differences in responses depending on the length of studying. The correctness of the answers of all groups of students oscillates between 68%-65%, (Figure 3). Also, the interaction chart (Diagram 4) indicates much larger intra-group differences than inter-group differences, which determines the lack of differences among the years. Thus, the null hypothesis that students' knowledge of patient's rights does not depend on the year of study of the respondents was confirmed.

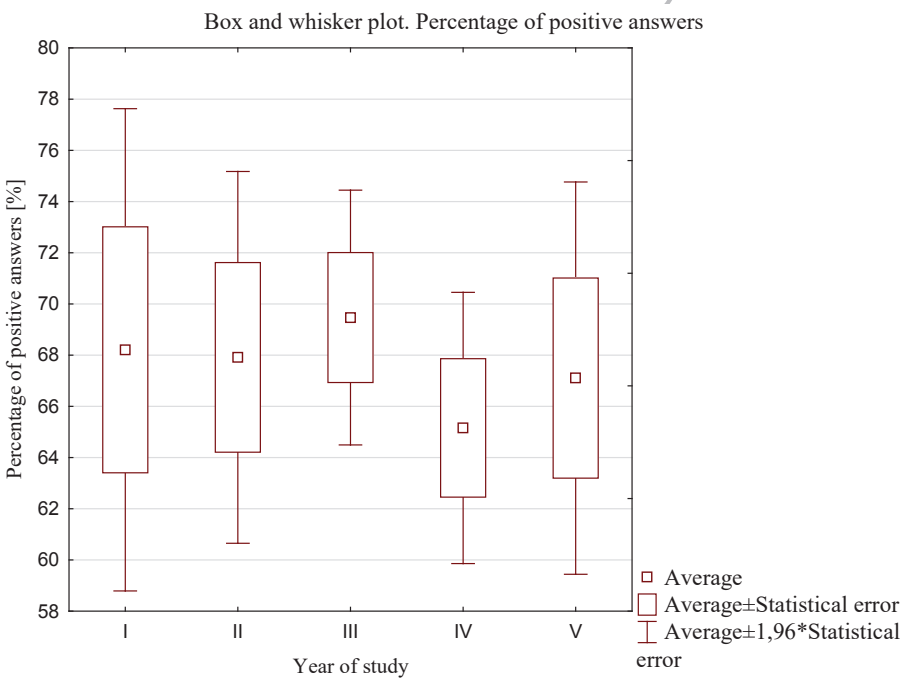


Diagram 3. Box-plot diagram for variables: year of study, percentage of positive answers

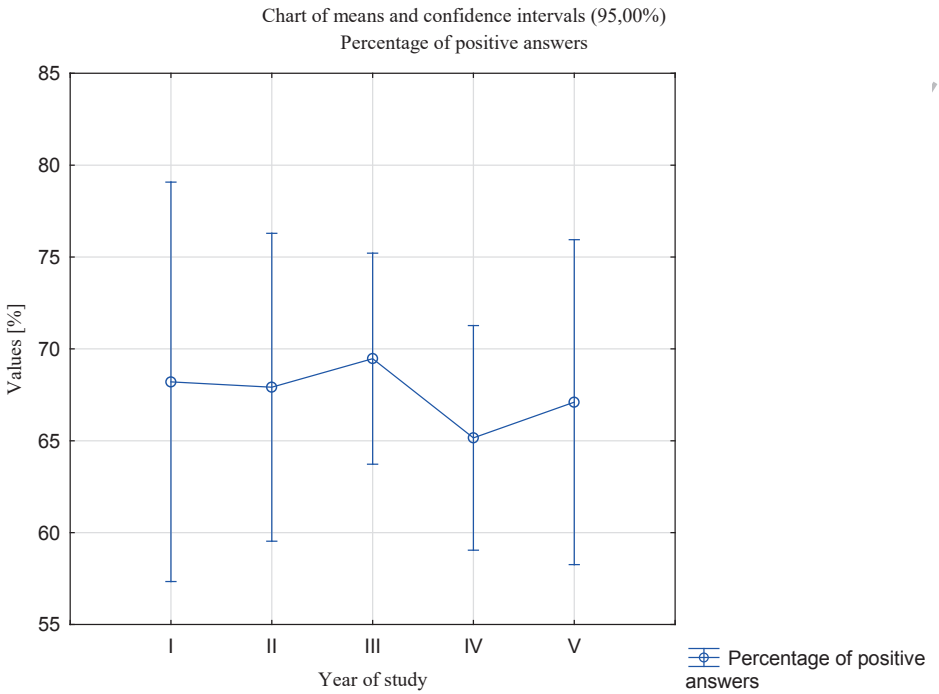


Diagram 4. Interaction diagram for variables: year of study, percentage of positive answers

Making a detailed analysis of the answers to the individual questions checking the knowledge of patient's rights among students of the Faculty of Health Sciences of the Medical University of Lodz it can be inferred as follows:

1. The right to medical confidentiality in special situations

To the question *Can the medical personnel not keep secret information about a patient against their will, when it may pose a danger to other people?* most respondents of all fields of study answered correctly. Respectively students of public health (75% of respondents), dietetics (70%), nursing (45%) and obstetrics (58%).

2. The right to consent to emergency treatment

To the question about *whether patients in a state of emergency or their legal representative have the right to object to the therapeutic procedure proposed by the doctor*, the students of all fields of study most frequently selected the correct answer. The most correct answers were given by students of dietetics (71% correct answers), the least – obstetrics students (48% correct answers).

3. The right to change the scope of surgery without the patient's consent

In the studied population, to the question about *Do you know in what situations the doctor can extend the surgery without patient's (or his legal representative) consent?* the highest percentage of respondents of all fields of study indicated the correct answer – *if not extending the scope of the operation would result in loss of life or severe disorder*. This variant of response was most popular among students of dietetics (68%), then public health (60%), nursing (50%) and obstetrics (48%).

4. The right to information on the patient's health condition

To the question *Do you think the doctor should inform the patient after the examination (...)?* the respondents of all fields of study most often chose the correct answer – *about the general health condition*. The percentage is as follows: students of dietetics (68%), public health (60%), nursing (50%) and obstetrics (48%).

5. The right to information about possible methods of diagnosis and treatment

To the question *Do you think a doctor should tell the patient (...)?* the students of all fields of study in majority responded correctly – *about all possible diagnosis methods*. Public health students particularly stood out from the others – 89% of the surveyed students gave the correct answer. They remained as follows: students of obstetrics (75% responded correctly), dietetics (68%) and nursing (43%).

6. The right to information about possible effects of treatment

In the study group, to the question *Should the doctor tell the patient about (...)?* the vast majority of students in all of the fields of study gave the

correct answer – *about all the effects of treatment, including the adverse ones*. The percentage distribution of the number of responses for the correct answer variant was as follows: public health – (92%), dietetics – (82%), obstetrics – (73%) and nursing – (71%).

7. The right to provide information on the patient's health condition

The vast majority of surveyed students of all fields of study correctly answered the question to indicate among those listed, who the doctor has the right to provide with the information about the patient's health – over 80% of the study population.

8. Right to view the patient's medical documentation

In the opinion of students of the surveyed fields of study, the majority of responses indicated that the patient, policyholder, Social Security, courts, prosecutor's office, police should have access to medical documentation kept by the hospital or doctor. Interestingly, as much as 80% of nursing students and 40% of obstetrics students also indicated the employer as the body authorised to view medical documentation.

Discussion and Conclusions

In 2018 Patient's Ombudsman conducted 1,517 explanatory proceedings in individual patient's cases, including [8]:

- 1,231 proceedings conducted on the basis of personally submitted written applications of patients or persons acting on their behalf,
- 286 own-initiative proceedings, including the ones regarding the information from the mass media or other public authorities, organisations and institutions.

A detailed distribution of explanatory proceedings in cases of violation of patient's rights in 2016-2018 is presented in Table 9.

In 2018 Patient' Ombudsman found 459 violations of patient's rights in 332 cases (within one explanatory proceeding compliance with more than one patient right has often been studied) [8].

Table 10 presents in detail the subject and scale of the found violations of patient's rights in 2014-2018.

Table 9. Distribution of explanatory proceedings of the Patient's Ombudsman in cases of violation of patients' rights in 2016-2018

Explanatory proceeding led:	2016		2017		2018	
own initiative	315	23%.	308	22%.	286	19%.
upon request	1045	77%.	1075	78%.	1231	81%.
Sum	1360	100%	1383	100%	1517	100%

Source: Sprawozdanie dotyczące przestrzegania praw pacjenta na terytorium Rzeczypospolitej Polskiej, Obejmuje okres od dnia 1 stycznia 2018 r. do dnia 31 grudnia 2018 r., Rzecznik Praw Pacjenta. Warszawa; 2019.

Table 10. Subject and scale of the found violations of patient's rights in 2014-2018

Found violations of patient's rights	2014		2015		2016		2017		2018	
	N	%	N	%	N	%	N	%	N	%
right to health services	127	33%	173	32%	209	38%	177	40%	215	47%
right to medical documentation	107	28%	186	35%	193	35%	140	32%	151	33%
right to respect for intimacy and dignity	13	3%	31	6%	40	7%	33	7%	23	5%
right to information and consent to the provision of health services	125	33%	127	24%	89	16%	73	16%	60	13%
the right to respect for private and family life	5	1%	5	1%	10	2%	7	2%	4	0.50%
right to confidentiality of information	4	1%	11	2%	7	1%	8	2%	6	1.50%
right to keep valuables in the deposit	0	0%	5	1%	4	1%	3	1%	0	0%
right to pastoral care	0	0%	0	0%	0	0%	0	0%	0	0%
right to report the adverse reactions of the medicinal product	0	0%	0	0%	0	0%	2	0.50%	0	0%
Sum	383	100%	538	100%.	552	100%	443	100%	459	100%

Source: Sprawozdanie dotyczące przestrzegania praw pacjenta na terytorium Rzeczypospolitej Polskiej, Obejmuje okres od dnia 1 stycznia 2018 r. do dnia 31 grudnia 2018 r., Rzecznik Praw Pacjenta. Warszawa; 2019.

In the subsequent years a slight but continuous increase in the number of identified violations of patient rights was observed. A particularly noteworthy is the clear increase in violations of the patient's right to provision of health services. Compared to the previous year, this value increased by 7%. This is the most frequently violated patient's right. In comparison to previous years the number of recognized irregularities in relation to the patient's right to medical documentation remains at the same high level. Similarly, as regards the patient's right to respect for intimacy and dignity.

However, there was an improvement in the patient's right to information and consent to the provision of health services; compared to 2014, the rate of identified violations of this right decreased by 20%. The presented data indicate that while the observance of the majority of patient's rights improves, in the case of patient's right to health services and medical documentation we are observing increasing problems with their implementation.

One of the most obvious and still observed reasons for violating patient's rights is their ignorance by both the patients themselves and, above all, those involved in the process of providing medical services. And this even though the issue of knowledge of patient's rights was raised from the very beginning, when they appeared in Polish legislation. Analysis of the research conducted by both government institutions and independent researchers [8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18] the increase of knowledge about patient's rights can be noted. Unfortunately, at the same time a dangerous dependence is seen – while the majority of patients and employees declare that they know patient's rights, this is only general knowledge, they are not familiar with the details. It is also confirmed by the results of the study "Patient's rights – Your rights" conducted by Ius Medicinae Foundation (results of the study on the awareness of the existence of patient's rights in the Polish society in 2013 and comparative analysis with the results of the study in 2008. Both studies were conducted by Millward Brown). Less than 60% of respondents said that they know at least one of patient's rights – which amounts to about

11% of the entire adult population. The most frequently spontaneously mentioned patient's rights were: the right to health services and the right to information – indicated by over 40% of respondents. Just over 20% spontaneously mentioned the right to privacy and confidentiality, consent and prevention. The least known patient's rights are the ones to treatment adjusted to the needs, respect for patient's time, respecting quality norms, and to innovations – below 6% of spontaneous indications and below 25% of assisted indications [19].

Similar conclusions present the results of the research conducted for this study. It was assumed that the field of study affects the level of knowledge about patient's rights. The analysis of results indicated that the answers of students of all faculties were similar. The Chi-Square test defined the probability coefficient of 0.21. The largest percentage of students of all faculties gave subjective answers with very good knowledge of patient rights.

The next analysis regarded the sources of knowledge about patient's rights. It was assumed that the sources of knowledge about patient's rights are different for the selected fields of study of the respondents. The Chi-Square test performed for verification purposes gave the indicator close to zero.

The last analysis regarded the comparison of knowledge of students of different years based on the correctness of substantive answers to questions about subsequent patient's rights raised in the survey. It was assumed that student knowledge about patient's rights does not depend on the year of study. For comparative analysis, a multivariate ANOVA test was performed. The data met the assumptions of normality of distribution and uniformity of variance. A probability coefficient of $p = 0.94$ allowed for the statement of the lack of differences between the answers depending on the length of study. In all surveyed students of the selected fields of study, the correctness of answers oscillated between 68% – 65%.

Referring to the substantive path devoted to a given field of study, it did not have a significant impact on the results of the research. According to the study plans of the researched fields of study of the Faculty of

Health Sciences of the Medical University of Lodz, only the second-year students of public health in uniform second-degree studies during classes in the specialisation „Medical Law in Health Care" had a separate subject devoted to patient's rights. In the other ones, there were only single lectures within various subjects.

Therefore, there is an urgent need to distinguish a subject related to patient's rights among the subjects taught at the Faculty of Health Sciences. Such a need, in the scale of the whole country (not only students but also health care employees) was also noticed by other authors of research in this field [20, 21] and the Patient's Ombudsman. He asked the President of the Supreme Medical Council to consider the possibility of expanding the number of lectures devoted to patient's rights in the vocational training program for doctors and other healthcare professionals and introducing opportunities for professional development of knowledge about patient's rights within organised forms of postgraduate education [8].

References

1. Karkowska D. Prawa pacjenta. Warszawa: Oficyna Wolters Kluwer Business; 2009.

2. Kmieciak B. Prawa pacjenta i ich ochrona. Lublin: Studium Socjologiczne KUL; 2015.

3. Konstytucja Rzeczypospolitej Polskiej z dnia 2 kwietnia 1997 r.

4. Ustawa z dnia 6.11.2008 r. o prawach pacjenta i Rzeczniku Praw Pacjenta. Dz.U. 2019.0.1127.

5. Serwach M. Prawo pacjenta do poszanowania intymności i godności. Medycyna Praktyczna 2013; 6: 116-120.

6. Bem&Wspólnicy. Naruszenie praw pacjenta [Internet]. 2018 [cited 2019.06.23]. Available from http://www.bemwspolnicy.pl/blog/prawo-medyczne/naruszenie-praw-pacjenta.

7. Moroz G. Prawa pacjenta – praktyczne omówienie wymogów. Ogólnopolski Przegląd Medyczny 2014; 5: 68-69.

8. Sprawozdanie dotyczące przestrzegania praw pacjenta na terytorium Rzeczypospolitej Polskiej, obejmuje okres od dnia 1 stycznia 2018 r. do dnia 31 grudnia 2018 r., Rzecznik Praw Pacjenta. Warszawa; 2019.

9. Wiedza o prawach pacjenta. Komunikat z badań. Warszawa: Centrum Badań Opinii Społecznej; 2011.

10. Podciechowski L, Królikowska A, Hładuńska J, Wilczyński J. Prawo pacjenta do informacji – aspekty prawne, medyczne i psychologiczne. Przegląd Menopauzalny 2009.

11. Karkowska D. Ustawa o Prawach Pacjenta i Rzeczniku Praw Pacjenta. Komentarz. Warszawa: Pub. Wolters Kluwer Polska – LEX; 2012.

12. Kujawa E, Łuków P. Prawa pacjenta, powinności lekarza. In: Opolski J., editor. Zdrowie publiczne. Wybrane zagadnienia. TOM II. Warszawa: Wydawnictwo Centrum Medycznego Kształcenia Podyplomowego; 2011.

13. Pawłowska E, Perzanowska K. Respektowanie praw pacjenta w samodzielnych publicznych zakładach opieki zdrowotnej – analiza przypadku. Wydział Organizacji i Zarządzania, Instytut Zarządzania, Administracji i Logistyki, 2017, Nr kol. 1972: 384-385.

14. Augustynowicz A, Budziszewska-Makulska A. Ustawa o prawach pacjenta i rzeczniku praw pacjenta. Komentarz. Warszawa: CeDeWu; 2010.

15. Kędzia A, Gniedziejko J. Wiedza na temat praw pacjenta wśród pielęgniarek. Przedsiębiorczość i Zarządzanie 2014; 15 12(2): 253-268.

16. Gotlib J, Dykowska G, Sienkiewicz Z. et al. Ocena wiedzy i postaw personelu medycznego Samodzielnego Publicznego Szpitala Klinicznego im. Prof. Orłowskiego w Warszawie wobec praw pacjenta. Annales Academiae Medicae Silesiensis 2014; 68(2).

17. Sobolewska K, Jacek A, Pietkiewicz A et al. Wiedza studentów ostatniego roku studiów niektórych kierunków UM w Białymstoku o prawach pacjenta. Zdrowie Publiczne 2008.

18. Tokarski Z, Wojciechowska M. Patients' opinion on the observance of patient rights by hospital nursing staff. JPHNMR 2014; 1: 28-31.

19. SWISS CONTRIBUTION. Projekt „Prawa pacjenta – Twoje prawa". Instytut MillwardBrown na zamówienie Fundacji Ius Medicinae; 2014.

20. Hajduk Ł, Binkowska-Bury M, Jacek A. Informowanie o prawach pacjenta przez personel medyczny. Prz Med Uniw Rzesz Inst Leków 2011; 3: 348-358.

21. Jacek A, Ożóg K. Przestrzeganie praw pacjenta przez personel medyczny. Hygeia Public Heath 2012; 47: 264-271.

Journal of Health Study and Medicine
2019, nr 2
ss. 123-138
DOI 10.36145/JHSM.2019.14

Social Reception of People on a Vegan Diet Based on Vegan Declarations

Adam Rzeźnicki[1]
https://orcid.org/0000-0002-9926-721X

Łucja Religa[2]

[1] Department of Social Medicine, Medical University of Lodz, Lodz, Poland
[2] Medical University of Lodz, Lodz, Poland

Address for correspondence

Adam Rzeźnicki
Department of Social Medicine
Medical University of Lodz
7/9 Żeligowskiego Str.
90-752 Lodz, Poland
e-mail: adam.rzeznicki@umed.lodz.pl

Abstract

Introduction: *Veganism is more and more popular in Poland, however, it still raises numerous controversies, although many environmental, ethical and nutritional reasons confirm its legitimacy.*

Aim: *The main purpose of the study was to find out the vegan opinions on the social perception of people on a vegan diet.*

Material and methods: *The survey was conducted among 950 respondents from January to June 2019, using the author's questionnaire containing 27 questions.*

Results: *Of all respondents (950 people), almost all, i.e. 93.7% (890 people), were women. The subjects were asked to indicate the main reason for choosing the vegan diet as a way of eating. The most frequently indicated responses were the ethical reasons – 69.1% of respondents (656 persons) and health reasons – such an answer was chosen by 47.8% of respondents (454 persons).*
Over a half of the respondents, 55.5% (527 people), admitted that they had met with uninvited comments on their meal several times, while 11.7% (111 people) replied that they met with such comments on a regular basis.
In the group of surveyed vegans, almost half of the respondents, i.e. 46.4% (441 people), replied that several times they were a victim of verbal aggression due to their diet, while 6.3% of respondents (63 people) met with this phenomenon regularly.

Conclusions: *According to vegans, social attitudes towards people on a vegan diet are unfavourable. Vegans are often perceived through the prism of stereotypes, which is why they are regularly exposed to unpleasant or even aggressive behaviour and are forced to argue with the views of others often based on false premises.*

Key words: *vegetarianism, veganism, nutrition, vegan diet*

Introduction

Veganism is getting more and more popular in Poland, however, it still raises numerous controversies, although many environmental, ethical and nutritional reasons confirm its legitimacy.

Veganism as a diet means excluding all animal products from the menu, which is why it is called a plant-based diet.

While vegetarianism is rarely considered a behaviour deviating from accepted social norms, veganism in Poland is still considered aberration.

Estimates carried out by the Institute of Agriculture and Food Economics indicate that the average Pole consumes 40.5 kg of pork, 30 kg of poultry and 2.2 kg of beef in a year. Compared to the general consumption of meat in Europe, Poles consume more of it – the average EU citizen eats 68.6 kg of meat but consumes several times more beef than people living in Poland [1].

The described situation may indicate that vegan restaurants are not popular in Poland – in fact Warsaw took seventh place in the ranking maintained by the Happy Cow website, which registers vegan places around the world [2]. Three components were taken into account in the ranking: 1 – the number of vegan restaurants within a radius of 8 km from the places where they are most concentrated, 2 – the number of vegan options in restaurants within a radius of 8 km from the places where there is the majority of them, 3 – the general impression of a pro-vegan initiative.

In Poland, we observe a regular increase in the number of people declaring vegetarianism and veganism. Such way of eating is particularly popular among young people. The observed trends should translate to the increased consumption of vegetables by Poles. However, it turns out to be quite the opposite, because the Central Statistical Office data shows that vegetable consumption has not increased in the recent years: 2015 – 8.68 kg, 2016 – 8.59 kg, 2017 – 8.24 kg [3, 4].

Scientific studies indicate that a well-balanced vegan diet is healthy. The American Dietetic Association believes the properly balanced vegetarian diets (including vegans) are healthy, cover caloric and energy

needs, and what is more, they can bring health benefits, especially by preventing the occurrence of some diet-related diseases [5]. Scientific societies also state that the properly balanced vegan diets can be used at any age but emphasise the necessity of special supervision over nutrition of children and adolescents [5, 6, 7].

As the results of research conducted at the University of Loma show, among people on a plant diet a lower BMI index is observed – such results were obtained by scientists from the University of Loma. 71,751 people were included in the study: non-vegetarians, semi-vegetarians, pescowegetarians, lacto-ovo-vegetarians and vegans. Among vegans compared to other groups there was the lowest percentage of overweight and obese people, and the highest of people with normal weight; the percentage of people on a vegan diet with a normal BMI, i.e. below 25, was 66.9%, there was 23.7% of overweight people, while 9.4% of all vegans were obese [8]. Studies by other authors indicate that vegetarian and vegan diets effectively reduce the risk of cardiovascular disease, obesity, type II diabetes and some types of cancer [5, 9, 10, 11, 12, 13].

People on a vegan diet usually consume larger amounts of fiber, magnesium, folic acid, vitamins C and E, iron or phytochemicals, while consuming fewer calories, saturated fat and cholesterol [14].

Meta-analyses conducted in Great Britain, the United States, Germany, the Netherlands and Japan involving 124,706 respondents showed that the mortality rate due to cardiovascular diseases in vegetarians was 16% lower than in non-vegetarian diets, while the risk of death from coronary heart disease was lower by 29%. Cardiovascular diseases risk factors: body mass index (BMI), total cholesterol, low density lipoprotein (LDL), and apolipoprotein B are lower in vegetarians (especially those on a vegan diet) than nonvegetarians [15, 16].

Although vegan diet is healthy, we need to keep in mind that, like any other diet, it can take an unhealthy form. An unhealthy vegan diet is one where vitamin B12 and D are not supplemented (in the winter months), the rules on proper caloric content of meals are not observed, highly processed products are consumed, not all nutritional values are provided –

these elements, except for cobalamin supplementation, are the determinants of all unhealthy diets.

Vitamin B12 supplementation plays the key role in a healthy and safe vegan diet. As indicated by the results of the study, the reserves of vitamin B12 accumulated in the body are sufficient for 3-6 years, and only after this time since the cessation of consumption of animal products, symptoms associated with deficiency can be observed [17]. The effect of cobalamin deficiency is megaloblastic anaemia – its insufficient supply leads to impaired production of erythroblasts and their premature destruction in the bone marrow; both factors contribute to inefficient erythropoiesis. Deficiency of the mentioned vitamin may also lead to a disorder in the synthesis of purine bases necessary for the construction of DNA, which is manifested in the malfunction of tissues with high cell turnover (an example may be the gastrointestinal mucosa), as well as improper myelin transformation and loss of nerve fibres, which in turn leads to various ailments from the nervous system [17].

Aim

The main aim of the study was to find out the vegan opinions on the social perception of people on a vegan diet.

Material and methods

The survey was conducted among 950 respondents from January to June 2019, using the author's questionnaire containing 27 multiple choice questions: 4 metric questions, 5 general questions and 18 specific questions. The survey was conducted online using the Google Forms questionnaire. The survey questionnaire was disseminated on Internet forums devoted to broadly understood vegan topics. The survey was voluntary and anonymous. 950 respondents participated in the survey. The data contained in the surveys were entered into the MS Excel spreadsheet. In order to develop the collected empirical material, descriptive methods and methods of statistical inference were used. For the description of the whole group of examined and subgroups distinguished on the basis

of qualitative features, the structure indicators were calculated, which were expressed as a percentage [%]. To compare the incidence of particular categories of quantitative features in the analysed groups, the chi-square independence test or chi-square independence test with Yates's correction was used. The results for which the values of the statistics obtained in the conducted tests belonged to the critical area of the relevant distribution at the significance level p = 0.05 were considered significant. For statistical analysis, STATISTICA version 10.0 was used.

Results

Of all respondents (950 people), almost all, i.e. 93.7% (890 people), were women (tab. 1).

The most numerous group of respondents, i.e. 61.2% (581 people) were people aged 19-29. People aged 40 and over accounted for only 5.3% (51 people) of all respondents (table 1).

In the group of all respondents (950 people) the most represented were the respondents with higher education – 458 people, i.e. 48.2% (table 1).

The most numerous group among all respondents, i.e. 42.9% (408 people) were respondents living in very large cities – over 500,000 residents (table 1).

The subjects were asked to indicate the main reason for choosing vegan diet as a way of eating. The most frequently indicated responses by the respondents were ethical reasons – 69.1% of respondents (656 persons), and health reasons – such answer was chosen by 47.8% of respondents (454 persons) (table 2).

Among all respondents (950 people), the largest group – 35.6% (338 people), were respondents who declared maintaining the vegan diet for over 2 years. The least numerous (7.7%, 73 people) were the respondents who maintained the vegan diet for 1-2 months (table 2).

Table 1. Respondents' characteristics

Gender	N	%
woman	890	93.7
man	60	6.3
total	950	100.0
Age	**N**	**%**
up to 18	161	16.9
19-29	581	61.2
30-39	157	16.5
40-49	47	4.9
50-59	3	0.3
60 years and more	1	0.1
total	950	100.0
Education	**N**	**%**
primary	20	2.1
junior high	109	11.5
basic vocational	11	1.2
secondary	352	37.1
higher	458	48.2
total	950	100.0
Place of residence	**N**	**%**
village	92	9.7
city to 50,000 residents	158	16.6
city over 50 to 150,000 residents	125	13.2
city over 150 to 500,000 residents	167	17.6
city over 500,000 residents	408	42.9
total	950	100.0

Table 2. Determinants of the choice of a vegan diet and the duration of maintaining a vegan diet by respondents

Reason for choosing a vegan diet (multiple choice question)	N	% of responses
Ethical reasons	656	69.1
Ecological reasons	380	40.0
Health reasons	454	47.8
Willingness to try a new way of eating	138	14.5
All of the above	180	18.9
Duration of following the vegan diet	**N**	**%**
1-2 months	73	7.7
3-6 months	142	14.9
7-12 months	176	18.5
Over a year to 2 years	221	23.3
Over 2 years	338	35.6
total	950	100.0

Among all respondents the vast majority, i.e. 82.9% (788 people), encountered the opinion that their following a vegan diet is only a temporary whim, a result of a trend (table 3).

The vast majority of respondents, i.e. 85.1% (808 people), met with the opinion of their interlocutors that the names of vegan dishes are inappropriate because they imitate the names of meat dishes (table 3).

In the group of surveyed vegans, 36.8% of respondents (350 people) replied that they regularly meet with the opinions of the public that their vegan diet does not provide the right amount of protein (table 3).

Over half of the respondents, 55.5% (527 people), admitted that they met with uninvited comments on their meal several times, while 11.7% (111 people) replied that they met with such comments on a regular basis (table 3).

Among all respondents 22.9% of vegans (218 people) while ordering vegan meals encountered remarks to not flaunt their diet (table 3).

Table 3. Selected social behaviours in relation to vegans and vegan diet declared by respondents

Encountering the opinion that the vegan diet is only a temporary whim, the result of a trend	**N**	**%**
Yes	788	82.9
No	162	17.1
Total	950	100.0
Encountering the opinion that the names of vegan meals (e.g. soy hot dogs, lentil pate) are inappropriate because they try to imitate their original meat/dairy counterparts	**N**	**%**
Yes	808	85.1
No	142	14.9
total	950	100.0
Frequency of opinions that a vegan diet does not provide enough protein	**N**	**%**
Never	60	6.3
Several times	540	56.8
Regularly	350	36.8
total	950	100.0
Frequency of uninvited comments about one's meal (e.g. emphasis of it not being fully nutritious)	**N**	**%**
Never	312	32.8
Several times	527	55.5
Regularly	111	11.7
total	950	100.0
Frequency of comments not to flaunt one's diet when ordering a vegan meal	**N**	**%**
Never	713	75.1
Several times	218	22.9
Regularly	19	2.0
total	950	100.0

Table 4. Frequency of becoming the object of jokes and a victim of verbal aggression due to the use of vegan diet by sex

Frequency of becoming the object of jokes because of a vegan diet	Women		Men		Total		p
	N	%	N	%	N	%	
Never	141	15.8	4	6.7	145	15.3	chi^2= 8,241; p<0,05
Several times	518	58.2	46	76.6	564	59.4	
Regularly	231	26.0	10	16.7	241	25.4	
Total	890	100.0	60	100.0	950	100.0	
The frequency of encountering verbal aggression (offence) because of a vegan diet	**N**	**%**	**N**	**%**	**N**	**%**	**p**
Never	423	47.5	26	43.3	449	47.3	chi^2= 0,764; p>0,05
Several times	410	46.1	31	51.7	441	46.4	
Regularly	57	6.4	3	5.0	60	6.3	
Total	890	100.0	60	100.0	950	100.0	

Every fourth respondent (25.4%, 241 people) admitted that they were regularly the subject of jokes due to their diet. In the group of women, the percentage affected by this behaviour was 26.0% (231 people), while in the group of men 16.7% (10 people). The observed differences turned out to be statistically significant – chi-square = 8,241; $p < 0.05$ (tab. 4).

In the group of surveyed vegans, almost half of the respondents, i.e. 46.4% (441 people), replied that several times they were a victim of verbal aggression due to their diet, while 6.3% of respondents (63 people) met with this phenomenon regularly. Compared with women, men encountered verbal aggression several times more often (51.7% vs 46.1%). The differences turned out to be statistically insignificant – $p > 0.05$ (table 4).

Discussion

Although eating is one of the basic physiological needs and can be regarded as somewhat trivial, it is entangled in a dense network of socio-cultural conditions. Veganism is visible in the construction of individual and social identities. However, all vegans cannot be ascribed the same features or aspirations – although the group is homogeneous from the outside, internally different issues (e.g. political, health) divide them.

In this study, the highest percentage of respondents (69.1%) indicated the ethical reasons as the main reason for using the vegan diet. Health reasons were the second most frequently indicated determinant of the vegan diet (47.8%).

In the study of Śliwińska et al. the respondents on a vegetarian diet gave following motivation to use this diet: caring for the well-being of the animals (96%), caring for their own health (95%), environmental protection (74%) disliking/not favouring the taste of meat (74%) [18]. The results of the study carried out by Pribis et al. showed that young people (11-20) more often choose a plant diet due to ethical and environmental reasons, while the older ones (41-60) are motivated by health reasons [19].

The results of own research showed that 42.1% of vegans regularly hear comments that they are following an unhealthy diet, and 36.8% that it does not provide enough protein.

In a study carried out by Śliwińska et al. it was noted that 40% of vegetarians and 77% of people on a traditional diet considered vegan diet to be not fully nutritious. In the group of non-vegetarians, 58% of the respondents gave protein as an insufficiently supplied ingredient on a vegan diet. 33% of the non-vegetarian group also said that vegan diet should not be used by anyone [18].

Names of food products that contain the word referring to meat products make potential customers know what form of the product and what taste they are dealing with. The above fact makes the use of „meat" terms seem helpful to both customers and food producers. From the linguistic point of view, the discussed phenomenon is neo-semantisation, i.e. giving the existing word in the language a new, additional meaning. Thus, the cutlet, which until now was understood as a flat-shaped piece of meat, can also be a vegetable dish, e.g. a cauliflower cutlet.

A study conducted for Ingredient Communications showed that in the opinion of 25% of respondents, the „meat" names of plant products, such as sausage, steak, burger, are incorrect and inappropriate. In the case of vegetarians, the percentage in question was 18%, vegans – 33%, while in the group of people using the traditional nutrition model – 26%. In the case of purchasing decisions, differences in the responses of vegans and vegetarians were noted. In the first group, the majority, i.e. 57%, said they were less likely to buy a plant product if the packaging was labelled with the word for meat product, while 49% of vegetarians said they were more likely to buy such a product. Nearly 60% of respondents who did not mind „meat" terms for plant product indicated that they correctly describe the structure and type of the product, while among those surveyed who were opposed to such naming, 60% of them pointed out the misleading function of naming [20].

In the analysed research the vegans were asked „Have you ever heard that the names of vegan meals (e.g. soy hot dogs, lentil pate) are inappropriate, because they try to imitate their original meat/dairy counterparts?" The vast majority of the respondents, i.e. 85.1%, confirmed it.

Conclusions

1. According to vegans, social attitudes towards people on a vegan diet are unfavourable. Vegans are often perceived through the prism of stereotypes, which is why they are regularly exposed to unpleasant or even aggressive behaviour and are forced to argue with the views of others often based on false premises.
2. It is necessary to intensify the educational activities of the society devoted to the principles of healthy eating, types of diets and the risks arising from improper nutrition in order to eliminate incorrect social attitudes resulting from a lack of knowledge in the area.
3. In the era of growing popularity of veganism in Polish society, there is a need to conduct further, systematic research to observe changes in social attitudes towards people on a vegan diet.

References

1. Zawadzka D. Rynek Mięsa Stan i Perspektywy. ISSN: 1231-2576. Warszawa; 2017.

2. Spector K, Brent E. 10 Top Vegan-Friendly Cities [Internet] [cited 19.10.2019]. Available from https://www.happycow.net/vegtopics/travel/top-vegan-friendly-cities.

3. Bielak R, ed. Polska w liczbach 2017. Główny Urząd Statystyczny, Departament Analiz i Opracowań Zbiorczych. Warszawa; 2017.

4. Bielak R, ed. Polska w liczbach 2018. Główny Urząd Statystyczny, Departament Analiz i Opracowań Zbiorczych. Warszawa; 2018.

5. Craig WJ, Mangels AR. Position of the American Dietetic Association: Vegetarian Diets. J Am Diet Assoc 2009; 109(7): 1266-1282.

6. Fewtrell M, Bronsky J, Campoy C et al. Complementary Feeding: A Position Paper by the European Society for Paediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN) Committee on Nutrition. J Pediatr Gastroenterol Nutr 2017 Jan; 64(1): 119-132.

7. Agnoli C, Baroni L, Bertini I et al. Position paper on vegetarian diets from the working group of the Italian Society of Human Nutrition. Nutr Metab Cardiovasc Dis 2017 Dec; 27(12): 1037-1052.

8. Rizzo NS, Jaceldo-Siegl K, Sabate J, Fraser GE. Nutrient profiles of vegetarian and nonvegetarian dietary patterns. J Acad Nutr Diet 2013; 113(12): 1610-1619.

9. Dinu M, Abbate R, Gensini GF, Casini A, Sofi F. Vegetarian, vegan diets and multiple health outcomes: A systematic review with meta-analysis of observational studies. Crit Rev Food Sci Nutr 2017 Nov 22; 57(17): 3640-3649.

10. Gili RV, Leeson S, Montes-Chañi EM et al. Healthy Vegan Lifestyle Habits among Argentinian Vegetarians and Non-Vegetarians. Nutrients 2019; Jan 12; 11(1), pii: E154.

11. Martínez-González MA, Sánchez-Tainta A, Corella D et al. A provegetarian food pattern and reduction in total mortality in the Prevención con Dieta Mediterránea (PREDIMED) study. Am J Clin Nutr 2014; Jul; 100 Suppl 1:320S-8S.

12. Jaacks LM, Kapoor D, Singh K, et al. Vegetarianism and cardiometabolic disease risk factors: Differences between South Asian and US adults. Nutrition 2016; Sep; 32(9): 975-84.

13. Singh PN, Arthur KN, Orlich MJ, et al. Global epidemiology of obesity, vegetarian dietary patterns, and noncommunicable disease in Asian Indians. Am J Clin Nutr 2014; Jul; 100 Suppl 1:359S-64S.

14. Craig WJ. Health effect of vegan diets. Am J Clin Nutr 2009; 89(5): 1627-1633.

15. Huang T, Yang B, Zheng J at al. Cardiovascular disease mortality and cancer incidence in vegetarians: a meta-analysis and systematic review. Ann Nutr Metab 2012; 60: 233-240.

16. Bradbury KE, Crowe FL, Appleby PN et al. Serum concentrations of cholesterol, apolipoprotein A-I and apolipoprotein B in a total of 1694 meat-eaters, fish-eaters, vegetarians and vegans. Eur J Clin Nutr 2014; 68: 178–183.

17. Czyż A, Matuszak M. Niedokrwistości z niedoboru witaminy B12 (kobalaminy) i kwasu foliowego. In: Korycka-Wołowiec A, Wołowiec D, Hus, eds. Hematologia w gabinecie. Warszawa: Wydawnictwo Lekarskie PZWL; 2017. pp. 90-99.

18. Śliwińska A, Olszówka M, Pieszko M: Ocena wiedzy na temat diet wegetariańskich wśród populacji trójmiejskiej. Zeszyty Naukowe Akademii Morskiej w Gdyni 2016; 64: 134-146.

19. Pribis P, Pencak R, Grajales T. Beliefs and Attitudes toward Vegetarian Lifestyle cross Generations. Nutrients 2010; 2(5): 523-531.

20. One in four consumers supports a ban on meat-related names for vegetarian products. A survey conducted by Surveygoo for Ingredient Communications [Internet] [cited 5.10.2019]. Available from https://data.surveygoo.com/@surveygoo/food-followup/.

Journal of Health Study and Medicine
2019, nr 2
ss. 139-156
DOI 10.36145/JHSM.2019.15

Blood Sugar Levels and Treatment Methods – Management of Therapeutic Processes in Type 2 Diabetes

Katarzyna Siedlacka-Pasierbiak[1]

Marian Sygit[2]
https://orcid.org/0000-0002-7902-7761

Katarzyna Sygit[2]
https://orcid.org/0000-0001-7173-2266

Jan Krakowiak[3]
https://orcid.org/0000-0002-3435-9658

[1] Poddebice Health Center, Poddebice, Poland
[2] State University of Applied Sciences, Kalisz, Poland
[3] Department of Social Medicine, Medical University of Lodz, Lodz, Poland

Address for correspondence:

Katarzyna Sygit
State University of Applied Sciences
4 Nowy Świat Str., 62-800 Kalisz, Poland
e-mail: ksygit@poczta.onet.pl

Abstract

Introduction: *Over the past few decades we have seen an increase in the incidence of type 2 diabetes in Poland and around the world. Fighting this disease is one of the main tasks of medicine in the 21st century.*

Aim: *The aim of this study was to describe the impact on the blood sugar level: physical activity, diabetes and antidiabetic drugs and other medicines and what is the ranking of these factors – in order to seek "new procedures" in the fight against diabetes.*

Material and methods: *The study concerned the period from 2012 to 2017, in which the impact of specific procedures used in the treatment of type 2 diabetes was analyzed through systematic daily testing of blood sugar levels, and the study of glycosylated hemoglobin levels.*

Results: *It was found that systematic measurements of sugar levels are important information for the patient about the proper health behavior of a person suffering from type 2 diabetes. A multivariant (comprehensive) treatment is the most effective method of lowering blood sugar levels. It was indicated that in the fight against type 2 diabetes, it is not enough to have an antidiabetic diet, only antidiabetic drugs or only physical activity.*
There has been a positive influence of the use of probiotics and vitamins in lowering the blood sugar level not described in the literature so far.

Conclusions: *The need to search for epigenetic factors determining the prevalence of type 2 diabetes was emphasized, with particular attention to the role of probiotics and vitamins.*

Key words: *prevention, treatment, diabetes, blood sugar, glycosylated haemoglobin level*

Introduction

Over the few past decades there has been a true explosion in the incidence of type 2 diabetes. Many specialists claim that fighting diabetes is one of the main goals of medicine in the 21st century. Due to the rapid increase in its incidence, it is justified to use the term "epidemic" in relation to type 2 diabetes – despite the fact that it is not a contagious disease. It is believed that the rapid increase in incidence of diabetes is related to the lifestyle of people around the world, associated mainly with a decrease in physical activity and an inappropriate, too caloric diet [1, 2, 3, 4, 5, 6]. Currently, 68% of US citizens are classified as obese or overweight [5, 6]. According to WHO, over 220 million people suffer from type 2 diabetes. In 2004, type 2 diabetes was the cause of 3.4 million deaths and the number of annual deaths caused by diabetes is expected to double by 2030 [6].

The epidemic of diabetes is expensive for both individuals and healthcare systems in individual countries. According to WHO, China alone will lose 558 billion dollars between 2006 and 2015 due to diabetes and its complications [5]. According to Centers for Disease Control and Prevention (CDC), 25.8 million people in the USA (or 8.3% of the total population) suffer from diabetes, while only 18.8 million are diagnosed. More than 79 million US citizens were diagnosed with pre-diabetes condition, and in 2010 alone 1.9 million new cases of diabetes were diagnosed [7].

Type 2 diabetes is a progressive disease. Initially, slight disturbances in the homoeostasis of energy metabolism trigger the mechanism of the vicious circle, which results in the development of the disease and its accompanying complications, leading to a significant reduction in the quality of life, disability and death. Due to the availability of blood glucose lowering drugs and numerous insulin formulations, the aforementioned acute complications of diabetes are not the main cause of mortality for those suffering from the disease. The main causes are: late complications in blood vessels (micro- and macroangiopathies), which may cause limb amputation, heart attack and stroke. Patient treatment is therefore focused on stopping the development of late complications; the search for an

effective method to stop the development of this disease is ongoing [8, 9, 10, 11, 12].

In patients with diabetes, the risk of heart attack and stroke is 2 to 4 times higher than in healthy individuals [13].

Numerous research results indicate a positive effect of physical activity and diabetic diet on the course of the disease [6, 14, 15, 16, 17, 18]. New anti-diabetic drugs are being constantly created and introduced; however, they are expensive and not all of them are refunded, which is a big limitation of their use.

The diabetic prevention – including maintaining normal body mass and appropriate, systematically undertaken physical activity and diet – is promising, but it is not sufficiently common, and its principles are not always observed by patients [19, 20, 21, 22].

The life of a patient with diabetes – especially the insulin therapy – is extremely tedious and disruptive –88yg d and it lowers the quality of life. Actions are being taken to search for more effective drugs, but also for other methods of combating the disease, both in terms of prevention and treatment.

This paper presents the results of long-term studies (observations) of various therapeutic procedures and their effect on the level of sugar in the blood serum. An important premise for conducting an analysis of daily tests was the fact that some significant correlations between blood sugar levels and treatment procedures were noticed.

The aim of the study

The aim of this study was to describe the effect of various therapeutic procedures on sugar levels in blood serum.

Research hypotheses

Based on our own (authors') observations and information obtained from patients treated for diabetes, it was assumed that various types of standard treatment may be helpful in treating type 2 diabetes.

Materials and methods

In the years 2012–2017 a population experiment was conducted, according to authors' planned research project. Its aim was to find supportive therapeutic methods for non-insulin-dependent diabetes mellitus. The experiment was carried out on a doctor diagnosed with type 2 diabetes – one of the co-authors of this study.

During the experiment, the sugar level was measured four times a day: on an empty stomach; 2 hours after breakfast; 2 hours after lunch; 2 hours after dinner.

Sugar levels were measured with the Aceu-Chec Activ glucose meter; glycated haemoglobin levels (HbA1c) were measured each time when the treatment method changed.

These measurements were performed during two hospital treatments (in a diabetology ward) in 2006 and 2007, and during six stays and sanatorium treatments, as well as during outpatient and home treatment in between local treatments.

The procedures which were added to the standard treatment were:

- Physical activity, which consisted of 2 hours of Nordic walking per day and half an hour of stationary bike riding a day, at a moderate pace.
- Rehabilitation treatments, in accordance with the ZUS (Social Insurance Institution) program.
- The treatment included additionally: probiotic (1 x day), vitamin $B_{complex}$ (3 x 1) and vitamin $C_{0.5}$ (3 x 1).

The preliminary analysis included results from 2,648 blood sugar tests and the results of HbA1c tests. To analyse the significance of statistical differences, mean values comparison test was used, namely the Student's t test, where p=0.05.

Results. Commentary

Table 1 contains results of blood sugar level tests. The patient used anti-diabetic drugs and anti-diabetic diet under hospital control.

There were no statistically significant differences between 2016 and 2017 (a, b) regarding blood sugar levels both on an empty sto-

mach and 2 hours after breakfast, 2 hours after lunch and 2 hours after supper.

The levels of glycosylated haemoglobin were lower by 0.11 in 2016 (a) and by 0.9 in 2017 (b). The observed differences were not statistically significant ($p>0.05$).

In Table 2, for 2 months the patient undertook systematic physical activity – Nordic Walking (2 hours a day) and ½ hour of stationary bike riding. The patient was on an anti-diabetic diet and used anti-diabetic drugs. Different sugar levels were recorded (on an empty stomach, 2 hours after dinner and 2 hours after supper): levels were significantly lower when the patient undertook physical activity (Nordic Walking for 2 hours a day and ½ hour ride on a stationary bike). The biggest differences were noted: 2 hours after supper, 2 hours after breakfast, and on an empty stomach; the smallest differences were observed two hours after dinner.

Table 3 presents the results of inclusion of other variables (apart from the use of anti-diabetic diet, anti-diabetic drugs and physical activity), which differentiated the blood sugar levels, namely: probiotics (1 x a day), vitamin $B_{complex}$ (3 x 1), vitamin $C_{0.5}$(3 x a day). It was observed that the highest blood sugar levels in 4 tests were accompanied by permanent stress and mental depression. The lowest levels were recorded when using the probiotics (1 x a day) and vitamin B_c (3 x a day).

Table 4 illustrates sugar levels recorded in 4 tests, when the patient used only diet, only physical activity and only drugs. It was found that the use of only physical activity and only anti-diabetic drugs resulted in the lowest reduction of sugar levels. However, only the anti-diabetic diet and only anti-diabetic drugs had a similar effect on the sugar level. Difference between 'only physical activity' and 'only diet' was statistically significant ($p<0.05$), as well as 'only physical activity' and 'the use of anti-diabetic drugs' ($p<0.05$).

Table 5 presents the effect of using probiotics, vitamin C, vitamin $_c$, physical activity, anti-diabetic drugs and no diet during a 2-month period.

Table 6 presents the effect of using probiotics, vitamin C, vitamin $_c$, physical activity, anti-diabetic drugs and diet during a 2-month period.

There was a slight decrease in sugar level in blood serum compared to Table 5, but it was not statistically significant (p>0,05). However, the use of probiotics, vitamin C, vitamin B_2 and anti-diabetic diet resulted in a significant decrease in sugar levels (to normal values).

Table 7 presents sugar levels in blood serum measured 4 times a day during stays (from 2012 to 2017, in sanatoria), using anti-diabetic diet, anti-diabetic drugs and intense physical exercise. Differences in the sugar level between individual stays in the sanatorium were statistically insignificant (p>0.05). All of them exceeded acceptable standards. Adding probiotics and vitamins (C and B) to the treatment caused the lowest blood sugar levels.

Table 1. Levels ($\bar{x}$) of blood sugar. The patient used anti-diabetic drugs and anti-diabetic diet

Hospital stay and treatment (days)	Blood sugar levels				HbA1c	Number of measurements
	on an empty stomach	2h after breakfast	2h after dinner	2h after supper		
	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$		
2016 (15)	105±16	139±15	147±15	140±10	7.09	240
2017 a (20)	108±17	143±13	149±10	143±9	6.98	240
2017 b (20)	116±10	153±8	160±7	138±11	7.0	240
Total	109±14.3	145±12	152±10.6	140±10	7.2	720

Table 2. Levels of blood sugar. The patient used anti-diabetic diet, anti-diabetic drugs and physical activity

Research period (number of months)	Periods of physical activity	Blood sugar levels				HbA1c	Number of measurements
		on an empty stomach	2h after breakfast	2h after dinner	2h after supper		
		$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$		
2	Nordic walking 2h daily	103±8.0	130±5.0	133±7	129±12	7.0	120
2	Nordic walking 2 hours daily + ½-hour ride on a stationary bike, daily	98±4.0	120±10.0	130±4.0	111±7	7.1	124

Table 3. Average levels of blood sugar. The patient used anti-diabetic diet, anti-diabetic drugs, physical activity, vitamins and probiotics

Research period (days)	Variables	Blood sugar levels				HbA1c	Number of measurements
		on an empty stomach	2h after breakfast	2h after dinner	2h after supper		
		$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$		
30	Probiotics 1 a day	100±20	120±11	124±9	111±10	6.81	120
30	Vitamin Bc (3x1)	99±6	122±8	130±4	110±9	7.07	120
30	Vitamin C0.5 (3x1)	100±9	140±4	137±4	130±10	7.10	124

Table 4. Levels of blood sugar. The patient used only diet, only physical activity, only drugs

Research period (days)	Blood sugar levels				HbA1c	Number of measurements
	on an empty stomach	2h after breakfast	2h after dinner	2h after supper		
	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$		
Only diet (20)	140±13	157±10	164±11	159±15	7.80	80
Only physical activity (20)	130±11	141±9	155±7	133±9	7.41	80
Only drugs (20)	140±10	160±13	161±9	148±12	7.52	80

Table 5. Average levels of blood sugar. The patient used probiotics, vitamin Bc, vitamin C, physical activity, anti-diabetic drugs

Research period	Blood sugar levels				HbA1c	Number of measurements
	on an empty stomach	2h after breakfast	2h after dinner	2h after supper		
	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$		
2 months	100±5.0	140±2.0	138±9	133±10	6.71	244

Table 6. Average levels of blood sugar. The patient used probiotics, vitamin Bc, vitamin C, physical activity, anti-diabetic drugs and anti-diabetic diet

Research period	Blood sugar levels				HbA1c	Number of measurements
	on an empty stomach	2h after breakfast	2h after dinner	2h after supper		
	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$		
2 months	97±4.0	137±7.0	131±5.0	130±2.0	6.52	248

Table 7. Average levels of blood sugar. The patient was on a diabetic diet, used drugs and intense physical activity, as well as rehabilitation treatments as per the ZUS program

Sanatorium stay and treatment (cardiac rehabilitation - 21 days)	Blood sugar levels				HbA1c	Number of measurements
	on an empty stomach	2h after breakfast	2h after dinner	2h after supper		
	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$		
2012	115±10	148±10	150±10	133±8	7.62	84
2013	120±11	150±9	149±3	144±10	7.51	84
2014	110±13	140±12	140±5	139±9	7.63	84
2015	130±9	143±11	147±8	137±10	6.91	84
2016	119±10	145±13	140±10	143±8	7.03	84
2017	108±9	141±10	137±7	133±7	7.53	84
Total	117±10.3	144±10.8	143±6.0	138±8.6	7.37	84

Discussion

Undoubtedly, the anti-diabetic diet, physical activity and anti-diabetic drugs are widely recommended for patients with type 2 diabetes [5, 6, 14]. However, many diabetic patients use either only drugs or only diet and few patients take up physical activity [6].

Diabetes patients either do not fully believe in the need for such treatment or do not have enough knowledge; effective drugs are difficult to access, and the lack of refunds makes them very expensive [19].

Scientists are constantly looking for new drugs and new methods for treating patients with diabetes. It is also made possible by observing patients, analysing their feedback and doubts [2.5].

The problem of effective prevention and treatment of diabetes is extremely poignant. Treatment of the consequences of diabetes is very expensive and not very effective. Therefore, gathering data, patient feedback, or the use of specific methods or procedures which are not very common is extremely important for the fight against diabetes [20].

Thus, it is still important to pay special attention to the implementation of a proper diabetic diet and physical activity.

Numerous studies indicate a resignation from percentage norms for carbohydrate, i.e. 40-50% of the energy value of the diet. The rationale behind this change is the lack of sufficient scientific evidence to determine the optimal amount of carbohydrates in the diet of a diabetic patient. Experts believe that the supply of calories provided in the form of carbohydrates should be broadly individualized (which is similar to the recommendations of other societies, such as the American Diabetes Association) [7]. Weight loss may be achieved using diets with reduced caloric content and various proportions of macro-elements (proteins, fats, carbohydrates). Depending on the individual preferences of patients, prevention and treatment of diabetes may use the following diets: Mediterranean, DASH (Dietary Approaches to Stop Hypertension), vegetarian or vegan, low-fat or low-carbohydrate. Despite the different views on the ideal proportions of macro-nutrients, the golden mean for the treatment of diabetes in patients requiring weight reduction remains a diet with reduced carbohydrate con-

tent. The main source of carbohydrates should be products with a glycaemic index <55 IG. In terms of salt intake, a general recommendation of up to 6g/day was left without restrictions for people with moderate hypertension and diabetic kidney disease [6, 21, 22, 23, 24].

The Polish Diabetes Association (PTD) emphasizes in its recommendations the huge role of physical exercise in the overall treatment of diabetes [16, 17, 18]. The overall fitness of the patient and accompanying diseases should be determined. Open-air exercises with a slow start and slow finish are especially recommended, as well as avoidance of exercises that cause tension and shortness of breath. The most appropriate form of activity in patients with type 2 diabetes aged 65+ and/or overweight is fast walking (up to shortness of breath), 3-5 times a week (approx. 150 minutes per week). Adequate physical activity for people with diabetes and overweight/obesity at any age is 'Nordic walking'. Individuals without significant contraindications, especially younger ones, should be encouraged to take up high-intensity physical activity, including sports. Such patients require additional education regarding the glycaemic effect caused by various types of physical activity (e.g. oxygen, resistance, interval exercises) [7, 14, 24, 25, 26, 27].

It is still unclear whether or not the use of, for example, diabetic diet is more important than the use of physical activity, and whether mere use of drugs is sufficient. Patient knowledge is insufficient in this regard.

In another publication, the authors [28] confirmed the need to look for other therapeutic procedures than the standard ones, and indicated the effectiveness of probiotics and physical activity – which significantly improved the quality of life of patients with type 2 diabetes. The health benefits related to the use of probiotics were – according to the researchers – significant, such as the elimination of the lactose intolerance effect through the bacterial β-galactosidase's impact on lactose [29].

Own (authors') observation, meticulous and professional conduct during the long-term experiment presented in this paper may encourage similar analyses aimed at facilitating the lives of people with diabetes and improving the quality of their lives [29, 30, 31, 32].

Conclusions

Following detailed observations and analyses, the collected data allows us to provide some insights regarding the conditions of blood sugar levels, namely:

1. Systematic tests of sugar levels (4 x a day) are important feedback to guide the health behaviour of a person suffering from diabetes.
2. Multivariant treatment procedures effectively lower sugar level in blood serum.
    - Not only the diet, anti-diabetes drugs or physical activity are beneficial; so are probiotics and vitamins C and B.
3. There is a need for further epidemiological and clinical studies and observations in order to search for epigenetic factors which determine the incidence, prevention and treatment of type 2 diabetes, with particular emphasis on the role of probiotics and vitamins B_c and C.
4. The study results confirmed the research hypothesis which assumed the existence of various non-standard therapeutic methods in the treatment of diabetes.

References

1. The Task Force on Diabetes and cardiovascular diseases of the European Society of Cardiology (ESC) and of the European Association for the Study of Diabetes (EASD). European Heart Journal 2017; 9 (suppl. C).

2. Gorska-Ciebiada M, Saryusz-Wolska M, Ciebiada M. Mild. Cognitive impairment and depressive symptoms in elderly patients with diabetes – prevalence, risk factors and co-morbidity. J Diabetes Res 2014; 17(2): 96-103. doi: 10.1155/2014/179648.

3. American Diabetes Association: Standards of medical care in diabetes-2016. Diabetes Care 2016; 39(6): 45-51.

4. Bailey CJ, Gross JL, Pieters A Bastien A, List JF. Effect of dapagliflozin in patients with type 2 diabetes who have inadequate glycaemic control with metformin: a randomised, double-blind, placebo-controlled trial. Lancet 2010; 375(22): 222-9. doi: 10.1016/S0140-6736(10)60407-2.

5. Sygit M. Zdrowie Publiczne [Pubic health]. Warszawa: Wolters Kluwer; 2017.

6. Sygit K, Sygit M. Eider J. The change of HbA1c parameters and the Body Mass Index In diabetes treatment cycle depending on the frequency of the undertaken physical activity program. Handel wewnętrzny 2017; 4(369): 412-24.

7. Tahrani AA, Bailey CJ, Del Prato S. Barnett AH. Management of type 2 diabetes: new and future developments in treatment. Lancet 2011; 378(9786): 182-197. doi: 10.1016/S0140-6736(11)60207-9.

8. List JF, Woo V, Morales E, Tang W, Fiedorek FT. Sodium-glucose cotransport inhibition with dapagliflozin in type 2 diabetes. Diabetes Care 2019; 32(6): 506-11. doi: 10.2337/dc08-1863.

9. Kearney PM, Blackwell L, Collins R, Keech A, Simes J, Peto R et al. Cholesterol Treatment Trialists' (CTT) Collaborators: Efficacy of cholesterol-lowering therapy in 18,686 people with diabetes in 14 randomised trials of statins: a meta-analysis. Lancet 2008; 371(22): 117-25. doi: 10.1016/S0140-6736(08)60104-X.

10. Brownlee M. Biochemistry and molecular cell biology of diabetic complications. Nature 2011; 414(16): 813-20. doi:10.1038/414813a.

11. Cosentino F, Lüscher TF. Endothelial dysfunction in diabetes mellitus. J Cardiovasc Pharmacol 1998; 32 Suppl 3: 54-61. PMID:9883749

12. Vlassara H, Bucala R, Striker L. Pathogenic effects of advanced glycosylation: biochemical, biologic, and clinical implications for diabetes and aging. Lab Invest 1994; 70(10): 138-51.

13. Kozek E. Cukrzyca i stany przecukrzycowe a choroby sercowo-naczyniowe. In: Podolec P, editors. Polskie Forum Profilaktyki. Kraków: Medycyna Praktyczna 2007; 243-9.

14. Rutkowski M, Bandosz P, Czupryniak L. Prevalence of diabetes and impaired fasting glucose in Poland – the NATPOL 2011 Study. Diabet Med 2014; 31(12): 1568-71. doi: 10.1111/dme.12542.

15. Czupryniak L. Diabetologia kompendium. Poznań: Termedia; 2014.

16. Zalecenia kliniczne dotyczące postępowania u chorych na cukrzycę 2016 Stanowisko Polskiego Towarzystwa Diabetologicznego. Diabetol Klin 2016; 5, suppl A.

17. Zalecenia kliniczne dotyczące postępowania u chorych na cukrzycę 2015 Stanowisko Polskiego Towarzystwa Diabetologicznego. Diabetol Klin 2015; 4, suppl A.

18. Zalecenia kliniczne dotyczące postępowania u chorych na cukrzycę 2014 Stanowisko Polskiego Towarzystwa Diabetologicznego. Diabetol Klin 2014; 3, suppl A.

19. Czech A. Profesjonalna edukacja terapeutyczna i behawioralna jako fundament opieki diabetologicznej — badania własne i standardy metodologiczne. Diab Prak 2011; 12(B): 10-18.

20. Pupek-Musialik D, Bogdański P, Zatoński W. Otyłość – zagrożenie XXI wieku. Otyli żyją krócej. Kardiol Dypl 2010; 9(7): 21-7.

21. Brytek A. Pandemia otyłości. Terapia, uzależnienia i współuzależnienia 2005; 1(40): 27-9.

22. Narodowy Program Zdrowia na lata 2016-2020 Ministerstwo Zdrowia [Internet]. 2016 [cited 2018 Jul 11]. Available from: https://www.gov.pl/zdrowie/npz-2016-2020.

23. Koalicja na Rzecz Walki z Cukrzycą. Raport o cukrzycy. Warszawa; 2013.

24. Esposito C, Gerlach H, Brett J, Stern D, Vlassara H. Endothelial receptor-mediated binding of glucose-modified albumin is associated with increased monolayer permeability and modulation of cell surface coagulant properties. J Exp Med 1989; 170(21): 1387-407. PMID:2551990.

25. Gugliucci A. Glycation as the glucose link to diabetic complications. J Am Osteopath Assoc 2011; 100(15): 621-34.

26. Niezaj M, Szymańska-Garbacz E, Pawłowski M. Świadomość własnej masy ciała u chorych na cukrzycę typu 2. Diab Prak 2011;12(B): 52-60.

27. Junik R. Dieta w profilaktyce nadmiernego przyrostu masy ciała. Diab Prak 2011; 12(B): 63-9.

28. Sygit M, Sygit K, Karkowski T, Krakowiak J. Lifestyle versus a person-s's life span. Central European Journal of Sport Sciences and Medicine 2018; 2(2): 51-60.

29. Szajewska H. Probiotyki w Polsce – kiedy jakie i dlaczego? Gastroenterologia Kliniczna 2010; 2(1): 1-9. doi: 10.18276/cej2018.2-6.

30. Steinka I. Wybrane aspekty stosowania probiotyków. Am Acad Med Geclan 2011; 41(4): 97-108.

31. Szajewska H, Fordymacka A, Badrowski J. Microbiological and genetic analysis of probiotic products licensed for medicinal purposes. Med Sci Monit 2004; 10(6): 346-50.

32. Szajewska H, Mrukowicz J. Probiotics in the treatment and prevention of acute infectious diarrhea in infants and children: a systematic review of published randomized, doubleblind, placebo controlled trias. J Pediatr Gastroenterol Nutr 2001; 33(15): 17-25.

Journal of Health Study and Medicine
2019, nr 2
ss. 157-169
DOI 10.36145/JHSM.2019.16

Predictors of Satisfaction with Life among People Working and Studying Extramural Simultaneously

Lucyna Golińska[1]
https://orcid.org/0000 0002 2119 7805

[1] Department of Social Psychology, University of Social Sciences, Lodz, Poland

Address for correspondence

Lucyna Golińska
Department of Social Psychology
University of Social Sciences, 1 Tokarzewskiego Str.
91-842 Lodz, Poland
e-mail: lgolinska@spoleczna.pl

Abstract

The role of satisfaction with job as a factor of satisfaction with life was the main aim of this research. Data from 148 employees were collected. They were studying and working simultaneously. The research also contains other factors as partners relationships, some of personal resources as self-efficacy, the dominant mood and Causative and Community Orientations. Regardless of gender, age and family situation the main predictors of life satisfaction turned out to be self-assessment and job satisfaction.

Key words: *life satisfaction, job satisfaction, causative orientation, community orientation, self-assessment, self-efficacy*

Introduction

One of the more and more frequent phenomena observed in the society's activities is undertaking studies or post-graduate training courses in order to obtain new knowledge, skills and professional perspectives hoping to achieve more satisfying job position, higher income, or personal growth. The most generally undertaken educational activity is to affect the quality and satisfaction with life understood by Czapiński as „emotional and/or cognitive balance of life in the dimension valuing good-bad, pleasant-unpleasant" [2, p. 25]. According to Zalewska [2], satisfaction with life remains in a close, but ambiguous relationship with satisfaction wiht life and means a well-thought-out overall assessment based on cognitive processes, reflection on one's life, and value judgements. E. Diener [3] recognises satisfaction with life as the result of an individual comparing their life situation with the standards they adopted.

An important component of human activity realised over many years of life is work. Its effect is to secure existence, but also to ensure the possibility of realising individual predispositions, abilities, sometimes an important element of self-realisation, as well as a plane of social relations. An important factor affecting the quality of life is job satisfaction. It is a cognitive work evaluation, expressed in the form of value-cognitive judgements, referring to overall job satisfaction (assessment of work as a whole) or satisfaction with individual work components, e.g. work content or colleagues [2]. Among the important individual factors determining job satisfaction are age – there is an increase in satisfaction with age. According to Helen Bee [5], professional satisfaction reaches the highest level in the period of average adulthood, which is associated with professional experience and the pursuit of work relevance, i.e. a greater matching of work abilities and requirements, which results in higher satisfaction. The family environment is also an important factor determining job satisfaction. Employees who experience an intense conflict of professional and family roles reveal less job satisfaction. This is confirmed by studies by Zalewska [6] and Lubrańska [7].

Aim of the research

The main aim of this research was to investigate what factors serve as predictors of satisfaction with life. In general, it is believed that the level of satisfaction with life depends mostly on the conditions of existence and events in life. However, numerous studies by Czapiński [1] and Diener [4] indicate a short term effect of these factors and a significant relation between satisfaction with life and certain individual properties of a person, genetically determined or arising in the course of life. The former includes personality variables, e.g. extroversion expressed by the individual's need for relationships with others and skilful coping in them. Another important resource, based on predispositions acquired in the course of life, is a sense of self-efficacy. These variables are treated as individual's resources. According to the individual and social orientation [8], each person strives for efficacy, that is effectiveness in meeting their needs, possibilities and ambitions, but also, in accordance with the community orientation for the close ones, the satisfying relations with certain people.

The presented research includes three groups of variables hypothetically affecting positively or inhibiting the sense of satisfaction with life. These are: selected individual resources, social relations and indicator of self-efficacy. In adult life, an important manifestation of efficacy is job satisfaction due to the fact that it is an indicator of the relationship between individual possibilities and their optimal implementation available during work to varying degrees. The mobilising roles of job satisfaction are indicated, among others, by Łaguna's research [9].

According to Zalewska [6], job satisfaction evaluation is based on cognitive processes using thoughts and assessments regarding various aspects of our intrapsychic functioning (easy or difficult, interesting, engaging or boring, giving joy or anxiety) and interpersonal (relationships with other employees, comparison).

Subjects of the research

The presented research was conducted among students of various extramural studies of University of Social Sciences. The original group consi-

sted of 148 people, including 90 women and 58 men. Due to the significant dominance of young people, i.e. less than 30 years old, it was decided to perform a comparative analysis within two relatively homogeneous age groups. The first group consisted of young people aged 19-28, the second group was aged 29 to 54. Distinguishing the above-mentioned groups was dictated by the age of the respondents, but also their specificity. The younger of these groups was characterized by three common parameters: work, most often taken up recently, undertaking extramural studies suggesting the need to obtain greater professional skills, or plans for radical change of professional functions as well as young age and marital status (maiden/bachelor), which allows to conclude about relatively initial experience in the field of partnerships. This group consisted of 112 people, including 71 women and 41 men, only 6 women and 1 man in this group were in a relationship and only 4 people reported having a child. To sum up the presented data, this group was young, with no family obligations, all people had secondary education and worked. The average seniority was 3 years, s = 2.23.

The older group was varied in age, average age was 36.5, s = 6.5. This group included 19 women and 17 men, marital status: 16 singles, 17 in a relationship, 3 people after divorce. 23 people were parents. Work experience on average, 14.1 years, s = 7.6.

Methods

The following methods were used in the research:

Causative and community orientation by Bogdan Wojciszke. It contains 30 adjectives that identify causative or community properties. The task of the respondents is to determine to what extent a given feature characterises them using a seven-point scale.

GSES – Generalized Self Efficiency Scale by R. Schwarzer and M. Jerusalem in the Polish adaptation of Z. Juczyński. The scale consists of 10 statements comprising one factor. It measures the strength of an individual's general belief in the effectiveness of dealing with difficult situations and obstacles. It has high statistical accuracy parameters.

Satisfaction with Life Scale (SWLS) created by E. Diener, R. A. Emmons, R. J. Larson, S. Griffin. Adaptation: Z. Juczyński. The scale contains 5 statements and a seven-point scale for their assessment by the examined person. It provides information about cognitive satisfaction assessment.

Satisfaction with Work Scale (SWS) by Anna Zalewska. Similar in form to SWLS. It provides information about the cognitive assessment of job satisfaction.

PFB Partner Relations Questionnaire (Partnerschaftsfragebogen) by Kurt Hahlweg (1996), which is used to diagnose the quality of relations between partners in relationships. The questionnaire contains 30 statements and covers three scales: mutual communication (MC), intimacy (I) and behavior in a quarrel (Q). Each scale contains 10 questions.

The Watson Scale for testing positive and negative moods. It contains 20 words describing different feelings. The task of the examined person is to determine the intensity of experienced emotions using a five-degree scale containing the possibilities from none or slightly to exceptionally.

I scale – prepared for the use of the reported research. The self-assessment contains 8 statements regarding health, skills, self-confidence and assessment of one's life choices. The answers contain four options, from definitely dissatisfied to definitely satisfied.

Work-Family and Family-Work Conflict Scale, in the Polish adaptation of A. Zalewska. The scale consists of 10 items, 5 of which relate to the two types of conflict mentioned above. The answers are marked on 7-step scale (from 1 – strongly disagree, to 7 – strongly agree)

Material analysis

The methods described above used in the study belong to three categories of variables, which hypothetically remain in relation to satisfaction with life.

Personality resources are: causative orientation, self-efficacy, predisposition to experiencing a positive or negative mood, perception and self-assessment (I variable).

Relationships with other people: the scale of partner relations (communication, intimacy, quarrels), community orientation.

Work-related: job satisfaction, work-family and family-work conflict.

The study groups were initially checked for similarities, taking into account within each of them the specificity of women and men. There were some differences in the „young" group: job satisfaction among women amounted to x = 23.4 and was significantly higher than among men:

x = 20.7, F = 3.99 p = .048.

Men more often than women indicated that they perceive family expectations as an obstacle to professional activity

K 16.89 <M 20.15 F = 17, 175 p = 000.

They also assessed the level of quarrels in partner relations as significantly higher compared to women

K x = 16.89 <M x = 20.15\ F = 17.175 p = 000.

Finally, men had a more positive mood.

In group II (older age) there were no significant differences when comparing men and women.

Table 1. Relationships between satisfaction with life and other variables, including gender and groups. Spearmann correlation coefficient

Satisfaction with life				
	Group 1 women	Group 1 men	Group 2	Both groups sum
Satisfaction with work	.416**	.504**	.485**	.460**
Sense of self-efficacy				.283**
Causative orientation	.330**	.255*		
Community orientation				
Relationships communication	.217*			.186*
Relationships intimacy				.135*
Relationships quarrels	-.235*	-.248	-.361*	-.273**

The specificity of the presented research is based on the common experience associated with the fact that despite work the subjects simultaneously started studying and therefore their current job satisfaction is insufficient. The specificity of the group described above suggests that:

1. Satisfaction with life is significantly related to job satisfaction
2. The role of job satisfaction is modified as the family ties and obligations increase (in this respect both groups differ significantly).
3. Predictors of life satisfaction are personality resources, i.e. a positive assessment of one's own abilities expressed in the I variable, predispositions associated with the dominant mood, causative orientation and a sense of self-efficacy.

The basic method for identifying the significance of relationships between the impact of the studied independent variables on life satisfaction is multiple linear regression using stepwise analysis. This method was used to define predictors within each of the research groups. The research was conducted separately with women and men due to the previously noted differences in the level of some of the variables treated as independent variables.

The basic predictors of satisfaction with life are job satisfaction and self-perception, i.e. I. This system repeats in both groups and does not depend on gender. In the group of examined women of older age and with longer professional experience, there is a variable regarding community orientation, i.e. mindfulness and attributing importance to relationships mainly with close relatives as a predictor of satisfaction with life. Men also have a trace predictor resulting from mood as a factor that positively (positive mood) or negatively (negative mood) affects the sense of satisfaction with life.

Hypothesis 1 was confirmed.

Table 2. Multiple step regression results: Dependent variable – satisfaction with life. Independent variables: job satisfaction, partnerships, self-assessment, causative and community orientations, self-efficacy, the dominant mood, conflict between work and family

		R-kw	Corr. R	R Change	Beta stand.	t	p.i.
Group 1 women	I Satisfaction with life	.642 .690	.412 .476	.403 .461	.533 .277	5.499 2.860	.000 .006
Group 1 men	I Satisfaction with work Positive mood Negative mood	.495 .580 .623 .662	.482 .558 .592 .624	.495 .085 .042 .040	.397 .271 .264 -.247	2.960 2.757 2.381 -2.051	.005 .009 .023 .048
Group 1 sum	I Satisfaction with work Relationships arguments	.421 .509 .538	.416 .500 .526	.421 .088 .029	.545 .303 .171	7.900 4.20 -2.564	.000 .000 .012
Group 2 women	I Satisfaction with work Community orientation	.510 .733 .802	.480 .697 .759	.510 .223 .069	.637 .478 .268	4.707 3.535 2.202	.000 .03 .045
Group 2 men	Satisfaction with work I	.521 .660	.489 .611	.521 .139	.722 .650	3.318 2.39	.005 .031

The next hypothesis contained the supposition of an increase in the predictor's strength related to job satisfaction when comparing both study groups. The change, although insignificant, is towards the strength of this predictor, while the influence of relationships with the loved ones disappears. In the younger group the factor „quarreks" in relationships appeared as a factor reducing life satisfaction, in the older group its impact is not noticeable. Perhaps this is a consequence of adapting with age to the variability of relationships with the loved ones or increasing tolerance, which resulted in minimising the impact of this variable on the sense of satisfaction with life.

The last, third, hypothesis assumed that the satisfaction with life also depends on the varied susceptibility to experiencing a positive or negative mood dominating in personality, focus on causative orientation and a sense of self-efficacy. Although the relationship between life satisfaction and the above variables is important, their role as predictors has not been confirmed.

Discussion of results

The conducted research raises a number of additional questions. The absence of predictors of self-efficacy is surprising, although the increase in this variable is significant when comparing older and younger people. It may be that the impact of this variable falls within the global result of self--perception and self-assessment (I variable) as an assessment of the degree of satisfaction with self-trust and self-confidence. A particularly interesting arrangement of the role of job satisfaction in life satisfaction would be to check the predictors in the group of people who take maximising their professional effectiveness without the intention of changing jobs. A group of young people who are new to work, most likely, are barely looking for a position to implement their usually just realized or acquired resources. They are only building the sense of self-efficacy. On the other hand, in the group of older people, the vast majority of respondents undertake studies in a field different from their professional activity, which suggests that they are consciously looking for a way to fulfil their professional preferences.

Also, the anonymity of the research is a factor conducive to a certain reflectionlessness when completing the tests, which on the one hand is a condition of increasing safety but also reduces the involvement of responders. The described research should be treated as significant empirical preparation for in-depth analysis of the problem .

References

1. Czapiński J. Psychologia pozytywna. Nauka o szczęściu, zdrowiu, sile i cnotach człowieka. Warszawa: Wydawnictwo Naukowe PWN; 2004.

2. Zalewska A. Skala satysfakcji z pracy – pomiar poznawczego aspektu ogólnego zadowolenia. Acta Universitatis Lodziensis Folia Psychologica 2003; 7: 49-60.

3. Diener E, Lucas R, Suh EM i wsp. Subjective well-being: Three decades of progress. Psychological Bulletin 1999; 125: 276-302.

4. Diener E. Subjective well-being. The science of happiness and a proposal for national index. American Psychologie 2000; 1: 34-43.

5. Bee H. Psychologia rozwoju człowieka. Poznań: Wydawnictwo Zysk i S-ka; 2004.

6. Zalewska A. Wiek, płeć i stanowisko pracy a zadowolenie z pracy. Psychologia Jakości Życia 2009; 8(1): 1-20.

7. Lubrańska A. Doświadczenia afektywne w pracy a zadowolenie z pracy – siła i jakość wzajemnych relacji. Studia Dydaktyczne 2013; 24-25: 253-263.

8. Wojciszke B, Cieślak M. Orientacja sprawcza i wspólnotowa a wybrane aspekty funkcjonowania zdrowotnego i społecznego. Psychologia Społeczna 2014; 9 3(30): 285-297.

9. Łaguna M. Satysfakcja z życia i satysfakcja z pracy a motywacja do podejmowania szkoleń: Doniesienie z badań. Psychologia Jakości Życia 2012; 11(2): 163-172.

10. Zalewska A. Wiek, płeć i stanowisko pracy a zadowolenie z pracy. Psychologia Jakości Życia 2009; 8(1): 1-20.