Baltic Journal of Health and Physical Activity 2019; 11 (2): 85-98
Journal of Gdansk University of Physical Education and Sport
e-ISSN 2080-9999

ORIGNAL

doi: 10.29359/BJHPA.11.2.09

The location of back pain as a factor differentiating the physical fitness of cadets of the Military Academy of Land Forces

Authors' Contribution:
A Study Design
B Data Collection
C Statistical Analysis
D Data Interpretation
E Manuscript Preparation
F Literature Search
G Funds Collection

Dariusz Lenart

General Tadeusz Kościuszko Military University of Land Forces in Wroclaw, Poland

abstract

Background: The training of candidates for officers-commanders is an important part of the training activities of the Polish Armed Forces. Currently, the basic path of obtaining this group of officers for the Polish Armed Forces is the education of graduates of secondary schools. The aim of the study is to evaluate the differentiation of the physical fitness level of cadets of the Military University of Land Forces depending on the back pain location.

Material and methods: The research material was collected as a result of tests conducted among cadets of the Military University of Land Forces in Wroclaw in the years 2015–2018. Their cardiorespiratory endurance, functional strength, running speed and agility as well as body balance were determined. In addition, spirometric measurements and a survey were conducted.

Results: The results obtained in the three-year study period indicate statistically significant differences in the level of only a small number of functional features of the selected groups of men depending on the location of back pain. Significant differences between the separate groups of cadets occurred in the cardiorespiratory endurance level, the forced expiratory volume in 1 second and the forced vital capacity in test I, the level of running speed and agility in test II as well as the forced expiratory volume in 1 second in test III.

Conclusions: The pain in the lower back was not a factor significantly differentiating the somatic structure of the cadets. The location of the lower back pain syndromes also did not differentiate most of the cadets' functional abilities. The three-year study period saw favorable changes in the somatic structure and physical fitness of the examined men.

Key words: back pain, physical fitness.

article details

Article statistics: **Word count:** 4,321; **Tables:** 12; **Figures:** 4; **References:** 34
Received: April 2019; **Accepted:** June 2019; **Published:** June 2019

Full-text PDF: http://www.balticsportscience.com

Indexation: Celdes, Clarivate Analytics Emerging Sources Citation Index (ESCI), CNKI Scholar (China National Knowledge Infrastructure), CNPIEC, De Gruyter - IBR (International Bibliography of Reviews of Scholarly Literature in the Humanities and Social Sciences), De Gruyter - IBZ (International Bibliography of Periodical Literature in the Humanities and Social Sciences), DOAJ, EBSCO - Central & Eastern European Academic Source, EBSCO - SPORTDiscus, EBSCO Discovery Service, Google Scholar, Index Copernicus, J-Gate, Naviga (Softweco, Primo Central (ExLibris), ProQuest - Family Health, ProQuest - Health & Medical Complete, ProQuest - Illustrata: Health Sciences, ProQuest - Nursing & Allied Health Source, Summon (Serials Solutions/ProQuest, TDOne (TDNet), Ulrich's Periodicals Directory/ulrichsweb, WorldCat (OCLC)

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflict of interests: Author has declared that no competing interest exists.

Corresponding author: Corresponding author: Dariusz Lenart, General Tadeusz Kościuszko Military University of Land Forces, Czajkowskiego 109 Street ,51–150 Wrocław, Poland; phone no.: 261 658 306; e-mail: d.lenart@wso.wroc.pl.

INTRODUCTION

Lower back pain syndromes are currently defined as a specific epidemic. These syndromes usually refer to ailments that may occur in the lumbar, sacral (sacroiliac) and lumbosacral areas and then radiate to the buttocks and lower limbs. They are an outcome of rapid changes in lifestyle of the contemporary man, a significant reduction in physical activity and related muscle weakness, obesity, abnormal body posture, inadequate load application on the back during work, repetition of certain movements and injuries [1]. As a rule, lower back pain syndromes are the onset of chronic, often progressive ailments frequently leading to physical incapacity, work disability and limitations in daily activities [2]. In Poland, according to research results, 72% of the population under the age of 40, and 66% of men and 30% of women older than forty suffer from back pain [3]. In most cases, lower back pain recedes after a short period of time. Some of the pain cases, however, are so cumbersome and long-lasting that people with such symptoms have to contact physicians or physiotherapists.

Lower back pain is an interdisciplinary problem. Therefore, the correct treatment of patients with pain syndrome of this part of the back means a multidisciplinary treatment, including physiotherapy, pharmacotherapy, psychotherapy, patient and family education regarding lifestyle as well as work and leisure [4]. The primary purpose of treatment in spinal pain syndromes is to enable a patient's return to the desired level of activity and participation in society and to prevent relapse and the prevalence of chronic conditions as well [5].

The issues of back pain in children and adolescents seem to be a very interesting research problem. The interest in this matter began to be extensive after the Finnish doctor J. J. Salamina's publication [6]. In the previous years, most researchers had believed that this problem did not affect children and adolescents. The clinical evaluation of back pain in children and adolescents is a serious diagnostic problem, despite the fact that many factors are included in the examination. Due to the exponential increase in the number of non-specific spine pain in children and adolescents, the European Commission's Research Executive Committee established the COSTB13 program [7] based on the results of clinical and questionnaire research.

In addition to the above-mentioned national and international research, works on the problems of lower back pain syndromes of the academic youth constitute a separate body of research. Various types of higher education institutions researched health status, physical activity, endurance and physical fitness, and the relationship between these factors and back pain [8, 9]. These studies showed that more than half of the examined students experienced pain in the lower back or felt it only at times, and that, over time spent studying, the severity of pain among students increased.

The issues of lower back pain syndromes have been repeatedly discussed in foreign publications, a majority of which involved back pain in pilots of aircrafts or helicopters [10, 11]. Polish authors dealing with issues of back pain syndromes also focus on this group of soldiers [12, 13, 14]. Regrettably, there are currently no publications on the problem of lower back pain syndromes in military students.

Therefore, the main aim of the study is to evaluate the differentiation of the physical fitness level of cadets of the Military University of Land Forces depending on the location of back pain. Moreover, the purpose of the study is to determine the variability of somatic structure and physical fitness of the tested students in the three-year period of education at the Military Academy.

MATERIAL AND METHOD

The research material was collected as a result of tests conducted among cadets studying at the Military University of Land Forces in Wroclaw at the Faculty of Management and Safety Engineering in the years 2015–2018. The study covered 189 men. The respondents' mean age was 21.9 years. The examination included anthropometric measurements, physical fitness tests, spirometric measurements and a survey. Measurements of basic somatic characteristics, such as height and body weight, were performed. The height of the body was measured with an anthropometer with the accuracy of 0.1 cm. Weight measurement was done on a medical scale with the accuracy of 0.1 kg. Based on measurements of height and weight, the body mass index (BMI) was calculated. Physical fitness was determined by means of the following motor tests: 3000-meter run (cardiorespiratory endurance), bent arm hang (functional strength), shuttle run 10 x 5 m (running speed and agility) and one leg standing (balance).

Parameters of the following respiratory functions were obtained: forced expiratory volume in 1 second (FEV1), forced vital capacity (FVC), peak expiratory flow (PEF). Measurements of the above parameters were performed using a Pneumo RS spirometer with the accuracy of 0.01 liters.

Measurements of functional abilities were carried out in sports facilities of the Military Academy of Land Forces in Wroclaw. The students performed physical aptitude tests in sports outfit, always under similar conditions.

The survey provided information on:

- types of injuries experienced by the cadets;
- periods during which the cadets suffered injuries;
- circumstances in which the tested men were injured;
- the location of back pain.

The collected material was developed using basic statistical methods. The calculated arithmetic mean, standard deviation and coefficient of variation were used to characterize the level of selected somatic and functional characteristics of the examined men.

Statistica version 9.0 for Windows (StatSoft Inc., USA) was used for statistical analysis. The arithmetic mean, standard deviation and coefficient of variation were calculated, which were used to define the characteristics of the level of the selected somatic features as well as functional and respiratory abilities of the subjects. In order to determine the statistical significance between the mean values of functional abilities and the location of back pain, a one-way analysis of variance (ANOVA) was performed. One of multiple comparative tests, i.e. the least significant difference (LSD) test, was used to determine which of the means were equal and which differed (in the case of rejecting the null hypothesis). The level of significance was set at $\alpha = 0.05$ (statistically significant differences were determined when $p < 0.05$). Changes in somatic characteristics, physical fitness and pulmonary function parameters in the subsequent stages of the study were presented in a traditional way, i.e. comparing means and calculating the significance of differences between te mean results with the use of Student's t-test for dependent variables.

RESULTS

Out of the total number of cadets, the highest percentage of respondents (29.2%) did not suffer any injuries during the three-year training period followed by those who suffered a joint injury (23.6%). The lowest percentage of the respondents (2.2%) suffered an orthopedic injury during the education process at the Wroclaw Military University (Fig. 1).

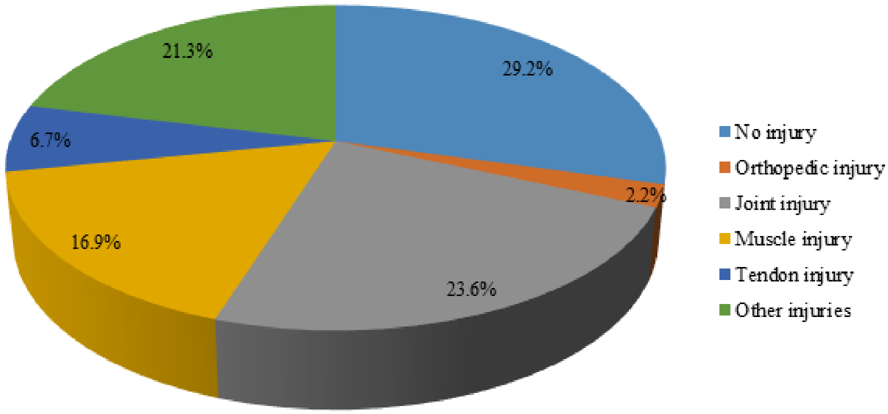

Fig. 1 Percentage distribution of the cadets by the type of injury or lack thereof

A similar and at the same time the highest percentage of the whole examined group suffered injuries during the second and the third year of studies (28.6% each) (Fig. 2).

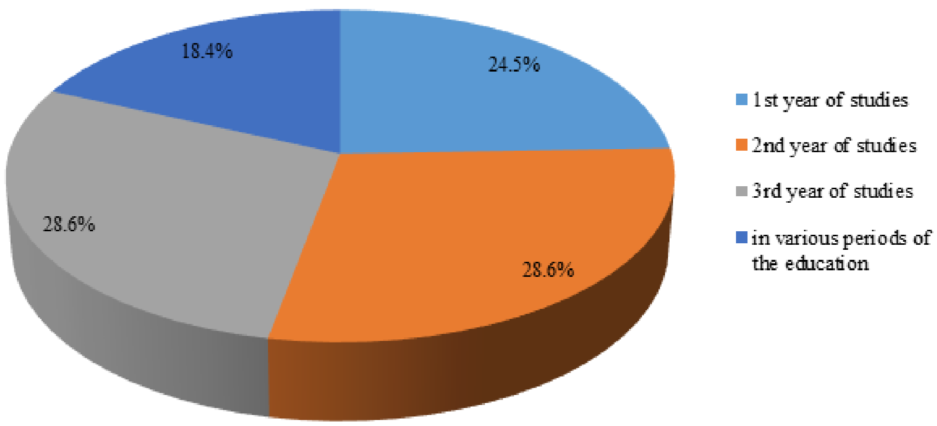

Fig. 2. Percentage distribution of the cadets by the time of injury occurence

Out of all cadets who experienced injuries during their education at the Military Academy of Land Forces, the largest group comprised those who had them during sports and health training, i.e. 38.1% (Fig. 3). The least numerous group of the cadets suffered injuries during the morning physical training (4.8%) and in many other circumstances (4.8%).

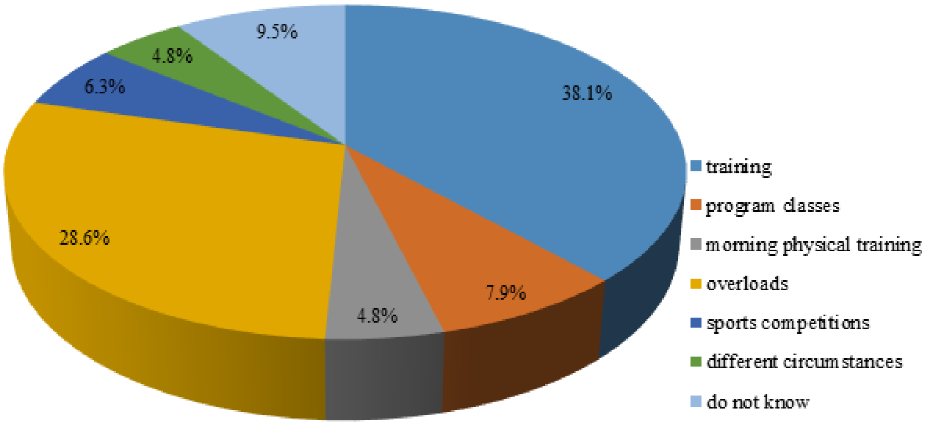

Fig. 3. Percentage distribution of the cadets by circumstances of injury occurence

The highest percentage of students (58.4%) among all the examined men did not experience any back pain syndromes during a three-year period of military education, while the lowest number (2.2%) suffered from lumbosacral back pain (Fig. 4).

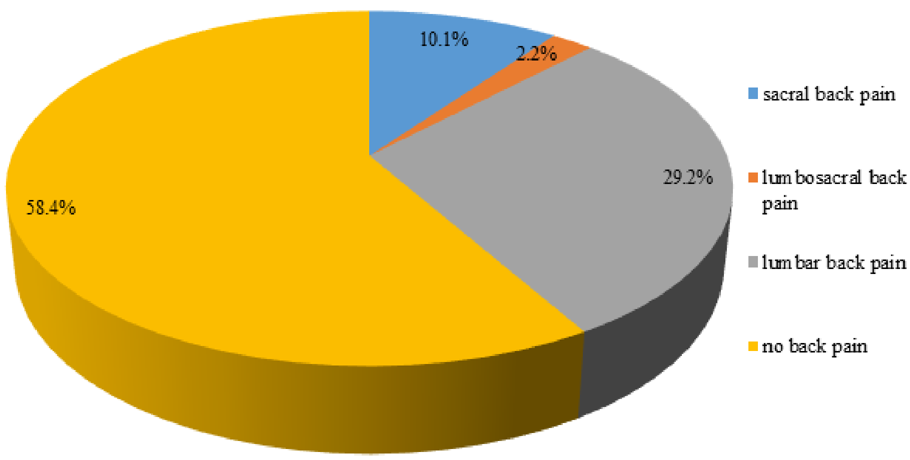

Fig. 4. Percentage distribution of the cadets by the location of lower back pain syndrome or lack thereof

The brief statistical characteristic of somatic features and the body mass index, which is presented in Tables 1 and 2, clearly indicates the beneficial and statistically significant changes that occurred in the somatic structure of the cadets during the three-year study period. Relatively low values of coefficients of variation and minor changes in their values over the whole study period proved the persistence of marginal or moderate differences in the examined men in terms of somatic features and the weight–height ratio.

Table 1. The descriptive statistics of selected somatic features of the cadets under research

Variable	Test I			Test II			Test III		
	x̄	s	v	x̄	s	v	x̄	s	v
Body height [cm]	177.75	5.49	3.09	177.76	5.49	3.09	177.90	5.01	2.82
Body weight [kg]	76.61	7.57	9.88	77.25	7.80	10.10	75.50	7.35	9.74
BMI [kg/m²]	24.22	1.84	7.60	24.30	1.97	8.11	23.89	1.84	7.70

Table 2. Significance of differences in mean values of the selected somatic features between particular research stages

Variable	I – II	II – III	I–III
Body height	**2.18**	**3.25**	**2.86**
Body weight	**2.23**	**8.97**	**7.22**
BMI	**2.29**	**7.99**	**6.44**

The bold-face indicates the t-Student test values (when there is a statistically significant difference between intergroup mean values of a given feature) and the p value (when $p < 0.05$).

The statistical characteristic of the functional abilities analyzed in the work shows favorable and statistically significant changes in the level of physical fitness and respiratory system efficiency during the three-year period research (Tables 3 and 4). Values of coefficients of variation and relatively small changes throughout the study period indicate different variability of the examined men in terms of functional abilities presented in the work.

Table 3. The descriptive statistics of the selected functional abilities of the examined men

Variable	Test I			Test II			Test III		
	x̄	s	v	x̄	s	v	x̄	s	v
3000-meter run [s]	795.05	68.76	8.65	747.46	45.10	6.03	742.27	42.50	5.73
Bent arm hang [s]	47.10	13.89	29.49	43.49	13.23	30.42	49.31	13.49	27.36
Shuttle run 10 x 5 m [s]	19.97	0.80	4.01	18.76	1.08	5.76	19.07	1.17	6.16
Balance [no. of attempts]	9.20	4.21	45.76	8.05	4.06	50.43	5.76	3.19	55.36
FEV^{-1} [l]	4.63	0.69	14.90	4.74	0.40	8.44	4.98	0.22	4.50
FVC [l]	5.63	1.10	19.54	5.68	0.59	10.39	6.08	0.26	4.21
PEF [l/s]	10.31	2.09	20.27	8.99	0.78	8.68	10.76	1.08	10.01

Table 4. The descriptive statistics of the selected functional abilities of the examined men

Variable	I – II	II – III	I–III
3000-meter run [s]	**7.93**	1.40	**8.37**
Bent arm hang [s]	**3.06**	**5.25**	**2.13**
Shuttle run 10 x 5 m [s]	**10.85**	**2.58**	**7.12**
Balance [no. of attempts]	**2.80**	**10.91**	**12.11**
FEV^{-1} [l]	1.39	**4.97**	**4.65**
FVC [l]	0.41	**5.59**	**3.93**
PEF [l/s]	**5.36**	**11.98**	**2.81**

The bold-face indicates the t-Student test values (when there is a statistically significant difference between intergroup mean values of a given feature) and the p value (when $p < 0.05$).

Table 5. The descriptive statistics of the selected somatic features of the selected groups of cadets by the location of back pain or lack thereof

Variable	Test	Selected groups of cadets by the location of pain											
		Sacral back pain N=39			Lumbar back pain N=46			Lumbosacral back pain N=32			No back pain N=72		
		$\bar{x}$	s	v	$\bar{x}$	s	v	$\bar{x}$	s	v	$\bar{x}$	s	v
Body height [cm]	I	179.42	7.12	3.97	177.14	4.93	2.78	182.55	6.29	3.45	177.47	5.35	3.01
	II	179.42	7.12	3.97	177.17	4.93	2.78	182.55	6.29	3.45	177.47	5.35	3.01
	III	179.42	7.12	3.97	177.17	4.93	2.78	182.55	6.29	3.45	177.48	5.34	3.01
Body weight[kg]	I	78.4	5.28	6.73	75.65	6.16	8.14	86.05	3.82	4.44	76.61	8.33	10.87
	II	78.5	4.71	6.00	76.85	6.65	8.65	89.88	4.91	5.46	76.97	8.3	10.78
	III	77.19	4.62	5.99	74.99	5.93	7.91	84.38	1.31	1.55	75.33	8.14	10.81
BMI [kg/m^2]	I	24.38	1.56	6.4	24.12	1.89	7.84	24.72	1.25	5.06	24.28	1.9	7.83
	II	24.42	1.51	6.18	24.51	2.13	8.69	25.81	1.25	4.84	24.4	1.96	8.03
	III	24.01	1.47	6.12	23.91	1.89	7.9	25.38	2.14	8.43	23.87	1.86	7.79

Table 6. The descriptive statistics of the selected functional abilities of the selected groups of cadets by the location of back pain or lack thereof

Variable	Test	Selected groups of cadets by the location of pain											
		Sacral back pain N=39			Lumbar back pain N=46			Lumbosacral back pain N=32			No back pain N=72		
		$\bar{x}$	s	V	$\bar{x}$	s	V	$\bar{x}$	s	V	$\bar{x}$	s	V
3000-meter run [s]	I	826.56	79.26	9.59	786.19	67.05	8.53	675.00	26.87	3.98	798.6	65.20	8.16
	II	765.22	30.29	3.96	740.77	41.84	5.65	774.00	26.87	3.47	748.00	49.04	6.56
	III	756.33	41.29	5.46	738.19	40.74	5.52	695.5	14.85	2.14	744.46	44.12	5.93
Bent arm hang [s]	I	44.12	11.26	25.52	45.19	10.89	24.1	44.05	6.43	14.60	49.14	15.75	32.05
	II	44.44	9.65	21.71	43.54	12.58	28.89	44.5	9.19	20.65	43.88	14.30	32.59
	III	46.56	11.11	23.86	49.62	13.17	26.54	52.5	2.12	4.04	50.00	14.42	28.84
Shuttle run 10 x 5 m [s]	I	20.54	0.79	3.85	19.79	0.84	4.24	19.9	0.01	0.05	19.96	0.76	3.81
	II	19.77	1.57	7.94	18.54	0.69	3.72	18.9	2.55	13.49	18.72	1.04	5.56
	III	19.50	1.23	6.31	19.03	1.10	5.78	19.3	0.14	0.73	19.05	1.23	6.46
One leg standing balance [number]	I	11.78	5.78	49.07	9.00	4.02	44.67	7.00	5.66	80.86	9.02	3.85	42.68
	II	10.22	2.49	24.36	7.15	3.64	50.91	10.00	1.41	14.10	8.13	4.43	54.49
	III	7.22	2.54	35.18	5.54	3.06	55.23	3.50	2.12	60.57	5.77	3.34	57.89
FEV_1 [l/s]	I	4.76	0.54	11.34	4.66	0.63	13.52	2.54	3.10	122.05	4.66	0.49	10.52
	II	4.77	0.51	10.69	4.77	0.33	6.92	4.68	0.23	4.91	4.72	0.43	9.11
	III	4.89	0.30	6.13	5.07	0.16	3.16	5.03	0.01	0.20	4.94	0.23	4.66
FVC [l]	I	5.94	0.86	14.48	5.79	0.93	16.06	3.17	3.81	120.19	5.58	1.01	18.1
	II	5.85	0.67	11.45	5.64	0.52	9.22	5.44	0.52	9.56	5.68	0.62	10.92
	III	5.97	0.40	6.7	6.17	0.18	2.92	6.19	0.07	1.13	6.05	0.26	4.30
PEF [l/s]	I	10.55	1.33	12.61	10.22	2.11	20.65	6.51	7.59	116.59	10.43	1.86	17.83
	II	8.73	0.92	10.54	9.01	0.86	9.54	9.05	0.30	3.31	9.05	0.73	8.07
	III	10.82	1.00	9.24	10.9	1.05	9.63	11.65	0.35	3.00	10.63	1.11	10.44

Baltic Journal of Health and Physical Activity 2019; 11 (2): 85-98
Journal of Gdansk University of Physical Education and Sport
e-ISSN 2080-9999

Table 7. The values of the ANOVA test results and the level of significance of differences between the means of the selected morphofunctional characteristics among the separate groups of cadets

Variable	Test	F	p
Body height	I	2.24	0.09
	II	0.95	0.42
	III	0.94	0.42
Body weight	I	1.38	0.25
	II	1.99	0.12
	III	1.22	0.31
BMI	I	0.10	0.96
	II	0.34	0.80
	III	0.44	0.72
3000-meter run	I	3.01	0.03
	II	0.87	0.46
	III	1.25	0.30
Bent arm hang	I	0.69	0.56
	II	0.01	1.00
	III	0.19	0.90
Shuttle run 10 x 5 m	I	2.10	0.11
	II	3.18	0.03
	III	0.42	0.74
One leg standing balance	I	1.40	0.25
	II	1.45	0.23
	III	1.01	0.39
FEV_1	I	7.51	0.00
	II	0.13	0.94
	III	2.72	0.05
FVC	I	4.15	0.01
	II	0.40	0.75
	III	1.95	0.13
PEF	I	2.40	0.07
	II	0.43	0.73
	III	0.86	0.46

The bold-face indicates the ANOVA test values (when there is a statistically significant difference between intergroup mean values of a given feature) and the p value (when $p < 0.05$).

The results obtained by the cadets throughout the research period indicate a similar somatic structure regardless of the location of back pain or the absence of pain (Tables 5 and 7). Although no significant differences in the mean values of the somatic features were observed, the students who experienced lumbar back pain were characterized by slightly slimmer body built compared to men in the other groups. This is evidenced by their lower body mass and body mass index. Notwithstanding the studied group, the mean values of the coefficients of variation were the lowest for the body height, higher and similar for the body weight and the body mass index.

The groups of cadets selected by virtue of the location of back pain or lack thereof had a similar level of physical fitness demonstrated by the lack of statistically significant differences between the majority of the analyzed functional abilities (Tables 6 and 7). Only in the case of cardiorespiratory endurance in test I, running speed and agility in test II, the forced expiratory volume in 1 second in tests I and III and the forced vital capacity in test I did significant differences between the test groups appear. In the case of cardiorespiratory endurance, the highest level of this functional ability related to students with back pain, both the lumbar back pain and the sacral back pain, and the lowest one – to the group experiencing sacral back pain (Tables 6 and 8).

On the other hand, in test II, the cadets with lumbar back pain were the fastest in the shuttle run 10 × 5 m, while the men suffering from sacral back pain proved the slowest (Tables 6 and 9). By contrast, the highest level of the forced expiratory volume in 1 second in test I was obtained by the men with sacral back pain and the lowest one by those experiencing lumbosacral back pain (Tables 6 and 10). In turn, in test III, the highest level of this functional ability was found in men suffering from lumbar back pain, and the lowest one in the group experiencing sacral back pain (Tables 6 and 11). In the case of forced vital capacity in test I, the highest level of this ability was observed among students with sacral back pain and the lowest among those with complex pain (Tables 6 and 12).

Table 8. Values of the LSD test results for the 3000-meter run [s] for the selected groups of cadets in test I

Group	Sacral back pain	Lumbar back pain	Lumbosacral back pain	No back pain
x̄	826.56	786.19	675.00	798.60
Sacral back pain		0.12	**0.00**	0.25
Lumbar back pain	0.12		**0.03**	0.44
Lumbosacral back pain	**0.00**	**0.03**		**0.01**
No back pain	0.25	0.44	**0.01**	

Table 9. Values of the LSD test results for the shuttle run 10 × 5 m [s] for the selected groups of cadets in test II

Group	Sacral back pain	Lumbar back pain	Lumbosacral back pain	No back pain
x̄	19.77	18.54	18.90	18.72
Sacral back pain		**0.00**	0.29	**0.01**
Lumbar back pain	**0.00**		0.64	0.49
Lumbosacral back pain	0.29	0.64		0.81
No back pain	**0.01**	0.49	0.81	

Table 10. Values of the LSD test results for the forced expiratory volume in 1 second [l/s] for the selected groups of cadets in test I

Group	Sacral back pain	Lumbar back pain	Lumbosacral back pain	No back pain
x̄	5.94	5.79	3.17	5.58
Sacral back pain		0.72	**0.00**	0.35
Lumbar back pain	0.72		**0.00**	0.41
Lumbosacral back pain	**0.00**	**0.00**		**0.00**
No back pain	0.01	0.49	0.81	

Table 11. Values of the LSD test results for the forced expiratory volume in 1 second [l/s] for the selected groups of cadets in test III

Group	Sacral back pain	Lumbar back pain	Lumbosacral back pain	No back pain
x̄	4.89	5.07	5.03	4.94
Sacral back pain		**0.03**	0.42	0.51
Lumbar back pain	**0.03**		0.76	**0.01**
Lumbosacral back pain	0.42	0.76		0.59
No back pain	0.51	**0.01**	0.59	

Table 12. Values of the LSD test results for the forced vital capacity [l] for the selected groups of cadets in test I

Group	Sacral back pain	Lumbar back pain	Lumbosacral back pain	No back pain
x̄	5.94	5.79	3.17	5.58
Sacral back pain		0.72	**0.00**	0.35
Lumbar back pain	0.72		**0.00**	0.41
Lumbosacral back pain	**0.00**	**0.00**		**0.00**
No back pain	0.35	0.41	**0.00**	

DISCUSSION

Lower back pain syndromes constitute the increasingly present health problem. According to many researchers, about 90% of people experience at least one back pain episode in their lives. In their opinion the age of pain occurrence is systematically reduced [6, 15]. According to Krawczyński [16], problems of the musculoskeletal system, mainly in the spinal area, are observed in 10–15% of children in Poland. Cottalorda et al. [17] stated that back pain appears in 84.1% of children and adolescents. The study of 489 pupils aged 13–16 years carried out by Kędra and Czaprowski in the Bialy district [18] showed that back pain syndromes vary in frequency. In most of the examined children, i.e. 340 patients (69.5%), the pain occurred episodically, several times a year, often or permanently. Skaggs et al. [19] found that in 26% of children in the UK back pain lead to school absenteeism. 40% of the children population in the study by Petersen et al. [20] at least once in life have had back pain and 13% have had recurrent pain.

The issues related to lower back pain syndromes in the academic youth are a very interesting research issue. According to Olsen et al. [21], the incidence of back pain in adolescents is about 30%. The review of the literature presented by Paprocka et al. [22] indicates that lower back pain is present in 70–80% of people under the age of 20 years and their incidence increases with age and more frequently affects women. The authors found that in 75% of patients symptoms withdrew after 4 weeks, in 15% lasted for 3 months, while the remaining 10% suffered from chronic pain. Sieradzki et al. [29] conducted a study of 110 students of the Faculty of Physiotherapy at the Medical University of Bialystok and observed that 46% of the students did not experience back pain, while over half (54%) had such problems permanently or periodically. The author's own studies confirmed a similar percentage of the studied group experiencing pain in the lower back. 41.5% of the military cadets of the Wroclaw Military Academy suffered from pain syndromes of this part of the back. However, according to Stefanowicz and Kloc [23], who carried out similar research on a group of 40 nursing students, 75% of the respondents felt back pain, whereas 25% did not. They listed lifting (35.09%), sitting (17.55%) and standing (21.05%) as the most frequent causes and circumstances of the pain symptoms occurrence [as above]. Similar conclusions are drawn from the research of 1321 students from Eastern Poland learning at four Polish universities in Faculties of Physical Education, Physiotherapy, Pedagogy as well as Tourism and Recreation [8]. The studies showed that lumbar back pains were a common occurrence among the students. The authors also found that lumbar back pain hindered or restricted students' daily activities such as sitting, standing or taking physical activity. Król et al. [24] observed during their research that non-specific back pain with the differentiated characteristics and clinical course is a common disorder among medical students. In addition, they noted that students in the examined population significantly differed in terms of physical activity, both in its total dimension and in leisure time. According to the authors, the level of physical activity clearly influences pain in the lumbosacral spine, but no relationship was seen between the time spent sitting and its occurrence and intensity. In Dega's opinion [25], in the back pain prevention, emphasis should be placed on strengthening the abdominal and paraspinal muscles in order to eliminate pain and to prevent such ailments. The author is convinced that physical activity and sports can be in favor of the above.

The phenomenon of back pain syndrome in soldiers has also been in the research interests of many authors. Nevertheless, most publications concern pain in aircraft and helicopter pilots [10–13]. Researchers on the subject have found a significant link between back pain and the number of hours spent by pilots, both of aircrafts and helicopters, in the air. The authors of numerous articles claim that the current knowledge about pain and preventive activities is insufficient [14, 26]. However, some researchers are aware of the phenomenon of the pain occurrence among other groups of soldiers [27–30]. Studies conducted on a group of more than 159,000 Israeli soldiers allowed the authors to state that the annual incidence of lower back pain syndrome was 0.05% [31]. The authors observed that the relative risk of back pain was higher among soldiers serving in administrative units than in combat and support units. According to Bery et al. [32], lower back pain is 70% more common in soldiers than in general population. This is due to the positions adopted and loads in the training and combat process. According to the authors, the US Marine Corps soldiers with spinal disk damage (77%) and chronic low back pain are characterized by the decreasing mobility range of the lumbar part of the spine, which is not the case in healthy soldiers of this formation. Research on the effectiveness of 6-month special muscular-nervous exercises and counseling programs aiming at the reduction of the incidence of lower back pain conducted among Finnish conscripts by Suni et al. [33] provide evidence that exercise and education to improve control of the lumbar spine positively affect the daily functioning and effectiveness of missions carried out within the military service. Taanila et al. [34] carried out research among 982 Finnish conscripts aged 18–28 years to determine the relationship between the low level of physical activity and pain in the lower back. In the authors' opinion, soldiers with the lower level of torso muscles endurance and low aerobic performance capacity are at a higher risk of pain syndromes of this part of the spine. In addition, these researchers observed an increased risk of lower back pain among lower educated soldiers.

Regrettably, in this part of the study it is not possible to perform a comparative analysis of the physical fitness of soldiers depending on the location of lower back pain syndromes due to the lack of available publications on the above research subject.

CONCLUSION

1. The location of back pain did not turn out to be a factor significantly differentiating the somatic structure of the cadets.
2. The location of lower back pain syndromes also did not differentiate most of the cadets' functional abilities. This factor significantly differentiated functional abilities only in the case of the cardiorespiratory endurance, the forced expiratory volume in 1 second and the forced vital capacity in test I, and running speed and agility in test II, as well as the forced expiratory volume in 1 second in test III.
3. During the three-year research period, favorable changes in the somatic structure and physical fitness of the examined men occurred.

REFERENCES

[1] Sous M, Stryła W. Ocena gibkości kręgosłupa chorych z zespołami bólów części lędźwiowej kręgosłupa na tle przepukliny jądra miażdżystego [Evaluation of spinal flexibility in patients with lumbar spine pain syndrome on the background of the nucleus of the sclerotic nucleus]. Post Rehab. 1999;13(3):45-55. Polish.

[2] Kiwerski JE. Problem bólów krzyża u młodzieży [Problem of sacral pains in adolescents]. Post.Rehab. 2001;15(2):11-15. Polish.

[3] Kołodziej K, Kwolek A, Rusek W, Przysada G, Szpunar P. Korelacja wskaźnika symetryczności obciążenia kończyn dolnych i nasilenia bólu u pacjentów z zespołem bólowym kręgosłupa lędźwiowo-krzyżowego rehabilitowanych szpitalnie [Correlation of symmetry of lower extremity load and pain intensity in patients with lumbar spine pain syndrome in hospital rehabilitation]. Przegląd Medyczny Uniwersytetu Rzeszowskiego. 2005;3:234-236. Polish.

[4] Dziak A. Komentarz prof. dr. hab. med. Artura Dziaka do „Zaleceń stosowania fizjoterapii u pacjentów z bólami krzyża" wydanych przez Holenderskie Królewskie Towarzystwo Fizjoterapii [Commentary by prof. dr. hab. Artur Dziak for "Physiotherapy Recommendations for patients with cross-pains" issued by the Royal Netherlands Society of Physiotherapy]. Rehab Med. 2004;8:28-30. Polish.

[5] Holenderskie Królewskie Towarzystwo Fizjoterapii [the Royal Netherlands Society of Physiotherapy]. Zalecenia stosowania fizjoterapii u pacjentów z bólami krzyża [Recommendations for physiotherapy in patients with sacral pains]. Rehab Med. 2004;8:6-26. Polish.

[6] Salamin JJ. The adolescent bag. A field survey of 370 Finnish school-children. Acta Paediatr Scand. 1984;315:1-122. https://doi.org/10.1111/j.1651-2227.1984.tb10003.x

[7] European Commission COSTB13. Management Committee European guidelines for the management of low back pain. Acta Ortop Scand. 2000;305(73):20-25. https://doi.org/10.1080/000164702760379503

[8] Kędra A, Kolwicz-Gańko A, Sitarski D, Ewertowska P, Czaprowski D. Bóle odcinka lędźwiowego kręgosłupa a funkcjonowanie studentów w życiu codziennym [Lumbar spine pains and the functioning of students in everyday life]. Ortop Traumatol Rehab. 2016;1(6):31-39. Polish. https://doi.org/10.5604/15093492.1198840

[9] Sieradzki M, Krajewska-Kułak E, Van Damme-Ostapowicz K. Ocena występowania zespołów bólowych dolnego odcinka kręgosłupa w populacji studentów kierunku fizjoterapia [Assessment of occurrence of low back pain in the population of physiotherapy students]. Probl Hig Epidemiol. 2013;94(3):451-458. Polish.

[10] Cunningham K, Ocherty S, Tyler AW. Prevalence of low back pain (LBP) in rotary wing aviation pilots. Aviat Space Environ Med 2010;81:774-778. https://doi.org/10.3357/ASEM.2736.2010

[11] Hansen B, Wagstaff AS. Low back pain in Norwegian helicopter aircrew. Aviat Space Environ Med. 2001;72:161-164.

[12] Mazurek K, Kozicki T. Wybrane problemy bólu kręgosłupa u pilotów wojskowych [Selected problems of spine pain in military pilots]. Probl Med Lot. 2001;2(5):47-54. Polish.

[13] Rąpała A. Problemy bólów kręgosłupa u pilotów wojskowych [Problems of back pain in military pilots]. Pol Przegl Med Lot 2005;12(2):145–151. Polish.

[14] Truszczyńska A, Lewkowicz R, Truszczyński O. Rąpała K, Wojtkowiak M. Back pain in polish military helicopter pilots. Int J Occup Med Environ Health. 2012;25(3):258-264. https://doi.org/10.2478/s13382-014-0254-z

[15] Gunzburg R, Balague R, Nordin M, Szpalski M, Duyck D, Bull D, Mélot C. Low back pain in a population of school children. Eur Spine J. 1999;8:439-443. https://doi.org/10.1007/s005860050202

[16] Krawczyński M. Polskie dzieci i młodzież na tle świata [Polish children and young people on the background of the world]. Ped Pol. 2006;81:787-793. Polish.

[17] Cottalorda J, Bourelle S, Gautheron V. Effects of backpack carrying in children. Orthopedics. 2004;11:1172-1177.

[18] Kędra A, Czaprowski D. Częstość występowania bólów kręgosłupa u uczniów powiatu bialskiego w wieku 13–16 lat [Frequency of spinal pain in pupils of the Bialy district aged 13–16]. Kwart Ortoped. 2012;3:351-360. Polish.

[19] Skaggs DL, Early SD, D'Ambra P, Tolo VT, Kay RM. Back pain and backpacks in school children. J Pediatr Orthop. 2006;26:358–363. https://doi.org/10.1097/01.bpo.0000217723.14631.6e

[20] Petersen S, Brulin C, Bergström E. Recurrent pain symptoms in young schoolchildren are often multiple. Pain 2006;121:145–150. https://doi.org/10.1016/j.pain.2005.12.017

[21] Olsen T, Anderson R, Dearwater S. The epidemiology of low back pain in an adolescent population. Am J Pub Health 1999;82:606–608. https://doi.org/10.2105/AJPH.82.4.606

[22] Paprocka J, Jamroz E, Głuszewicz E, Klimczak A, Kluczewska E, Marszał E. Zespoły bólowe kręgosłupa u dzieci [Spinal pain syndromes in children]. Wiad Lek 2008;61(7–9):183–189. Polish.

[23] Stefanowicz A, Kloc W. Rozpowszechnienie bólów krzyża wśród studentów [Common sacral pains among students]. Pol Ann Med 2009;16:28–41. Polish.

[24] Król A, Szczygieł E, Bilski J, Golec J, Masłoń A. Poziom aktywności fizycznej, a niespecyficzny ból kręgosłupa w wybranych grupach młodzieży [Level of physical activity and non-specific spine pain in selected youth groups]. Ostry Dyżur 2014;7(1): 11-15. Polish.

[25] Dega W. Profilaktyka i zachowawcze leczenie w zespołach bólów dolnego odcinka kręgosłupa [Prevention and conservative treatment in low back pain syndromes]. Warszawa: PZWL; 1978. Polish.

[26] Landau DA, Chapnick L, Yoffe N, Azaria B, Goldstein L, Atar E. Cervical and lumbar MRI findings in aviators as a function of aircraft type. Aviat Space Environ Med 2006;77(11):1158–1161.

[27] George SZ, Childs JD, Teyhen DS, Wu SS, Wright AC, Dugan JL, Robinson ME. Predictors of occurrence and severity of first time low back pain episodes: Findings from a military inception cohort. PLoS One. 2012;7(2).e30597. https://doi.org/10.1371/journal.pone.0030597

[28] Hiebert R, Campello MA, Weiser S. Ziemke GW. Fox BA, Nordin M. Predictors of short-term work-related disability among active duty US Navy personnel: a cohort study in patients with acute and subacute low back pain. Spine J. 2012;12(9):806–816. https://doi.org/10.1016/j.spinee.2011.11.012

[29] Kardouni JR, Shing TL, Rhon DI. Risk factors for low back pain and spine surgery: A retrospective cohort study in soldiers. Am J Prev Med. 2016;51(5):129–138. https://doi.org/10.1016/j.amepre.2016.06.005

[30] Mattila VM, Sillanpää P, Visuri T, Pihlajamäki H. Incidence and trends of low back pain hospitalisation during military service – An analysis of 387,070 Finnish young males. BMC Musculoskelet Disord. 2009;19:10:10. https://doi.org/10.1186/1471-2474-10-10

[31] Moshe S, Zack O, Finestone AS, Mishal M, Segal N, Slodownik D, Yagev Y. The incidence and worsening of newly diagnosed low back pain in a population of young male military recruits. BMC Musculoskelet Disord. 2016;13(17):279. https://doi.org/10.1186/s12891-016-1136-2

[32] Berry DB, Rodríguez-Soto AE, Su J, et al. Lumbar spine postures in marines during simulated operational positions. J Orthop Res. 2017;35(10):2145-2153. https://doi.org/10.1002/jor.23510

[33] Suni JH, Taanila H. Mattila VM, et al. Neuromuscular exercise and counseling decrease absenteeism due to low back pain in young conscripts: A randomized, population-based primary prevention study. Spine (Phila Pa 1976) 2013;38(5):375-384. https://doi.org/10.1097/BRS.0b013e318270a12d

[34] Taanila HP, Suni JH, Pihlajamäki HK, et al. Predictors of low back pain in physically active conscripts with special emphasis on muscular fitness. Spine J. 2012;12(9):737-748. https://doi.org/10.1016/j.spinee.2012.01.006

Cite this article as:

Lenart D.
The location of back pain as a factor differentiating the physical fitness of cadets of the Military Academy of Land Forces
Balt J Health Phys Act. 2019;11(2):85-98
doi: 10.29359/BJHPA.11.2.09