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Injury Framework and Relevance of Physiotherapy of Upper Limbs` Injury and Pain Syndromes in Cadets of Higher Military Educational Institutions

Zakres urazów i znaczenie fizjoterapii urazów i zespołów bólowych kończyny górnej u kadetów wojskowych szkół wyższych

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SUMMARY

Aim: To justify the need of introduction of physiotherapy for the prevention and rehabilitation after injuries and pain syndromes of upper limbs in cadets.

Materials and Methods: The research was conducted on the basis of the Hetman Petro Sahaidachnyi National Army Academy. At the first stage, data from the documents from the medical department on recorded injuries in the Academy cadets for the period 2018-2020 were analyzed. At the second stage, cadets of 1st, 2nd and 3rd courses of the Department of Combat Use of Forces were questioned about their experience of injuries and occurrence of pain syndromes. The total number of respondents equaled 256.

Results: Analysis of medical data revealed that in 2018-2020 years there were 53 cases of injury in cadets. Fractures was on the top of the structure of registered injuries – 45% out of the total number of injuries; the cerebral injuries equaled 16% and bruises – 11%. Analysis of the experience of injury and occurrence of pain syndromes found that the most common were lower limbs` injuries (35% out of the total number of injuries indicated by the respondents), back injuries (25%) and upper limbs` injuries (15%) in cadets of all years of studying. According to the localization of injuries, they were distributed as follows: complaints of injuries in lower limbs were in 86 (35%) cadets; in the upper limbs – among 36 cadets (15%); back injuries was indicated by 62 (25%); the head injury – by 27 (11%), the neck injury – 17 (7%), the abdomen – 12 (5%), the chest injury was indicated by 6 (2%) respondents.

Conclusions: The main part of complaints in cadets was occurrence of injuries and pain syndromes in lower and upper limbs, as well as in the back. Injuries of the upper limbs in cadets were a big problem throughout the training period, and in 16% of respondents, pain in the upper limbs was present for some period in recent month before the survey. The intensity of pain ranged from weak to severe.

Key words: Shoulder, Military, Exercise Therapy, Chronic Disease, Overused injury

Słowa kluczowe: bark, wojsko, terapia ruchowa, choroba przewlekła, urazy nadużywane

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INTRODUCTION

Physical training, participation in sports and applied exercises in the framework of military training are an important and integral part of the training in cadets of higher military educational institution (HMEI) [1, 2]. Physical training of cadets of Ukraine HMEIs, provides theoretical component and practical training of specific skills and qualification of military service. These skills include defense tactics, gunnery drill, live throwing, as well as wearing a specilal gear, carrying military equipment, etc.

Lots of physical activities and a desire in cadets to improve their results may lead to injuries of the musculoskeletal system [3]. Acute injuries during training can be associated with the method of leading drills, the peculiarity of performing exercises, inappropriate material and technical support, behavior of cadets [4]. However, overuse injuries (accumulative and chronic injuries due to overuse) occupy the first place in statistics of injuries in military during training and mainly arise in the period of increasing volume and intensity of physical training [5]. The study by Almeida SA et al. (1999) found that 36.9% of male recruits suffered musculoskeletal injuries during a 12-week boot camp training [5]. The main localizations of injury in recruits were lower limbs, back and upper limbs [6]. Although many injuries of the musculoskeletal system associated with physical activity can be prevented, in Ukraine there are no studies on the structure of injuries in cadets and their rehabilitation.

Development of effective preventive strategies and physiotherapy programs in case of injury requires understanding of injury prevalence, potential risk factors, and the need for cadets to recover.

AIM

To justify the need of introduction of physiotherapy to prevent and rehabilitate cadets after injuries and pain syndromes of upper limbs.

MATERIALS AND METHODS

The research was conducted on the basis of the Hetman Petro Sahaidachnyi National Army Academy (Academy).

At the first stage, data from the documents from the medical department of the Academy on recorded injuries in cadets (2018–2020) were analyzed.

At the second stage, a survey in men cadets of first, second, and third=years of studying from the Faculty of Combat Arms was organized. The total number of respondents was 256 people: 79 cadets of first year, 90 – of second and 87 – of third year of studying. The survey was conducted in live format using questionnaires to be completed in writing.

To retrospectively assess the level of injuries and occurrence of pain syndromes in cadets, a special questionnaire was developed. It included·introductory information, data on the presence or absence of a conflict of interest and part about an informed consent. The first section of the questionnaire was devoted to identify the sociodemographic characteristics of cadets; the second – the presence of an experience of injury during training; the third – the occurrence of injuries in upper limbs.

The answers were analyzed quantitatively and qualitatively.

The volume of exercise load (VEL) was counted according to the formula:

$$VEL = training\ duration\ (years) * 52 * number\ of\ trainings\ (hrs\ per\ week)$$

If any respondent indicated only duration of training in a certain sport/physical activity in years without specifying the number of classes per week, the average value (3 hours per week) was used to calculate the VEL index. If the respondent specified the range of hours of training, a smaller value was used to count the VEL. If the respondents indicated only sport/physical activity, which they were performing before entering a military educational institution, without the duration of training in years, the VEL was not calculated.

The research protocol was approved by the Committee on Bioethics of Lviv State University of Physical Culture named after Ivan Boberskyj. Respondents were acquainted with the aim and objectives of the study, their rights; participants could refuse to participate at any stage of the study.

RESULTS

Analysis of medical data revealed that during 2018-2020, 53 cases of injury were registered in cadets (Table 1). The centrepiece in them were fractures (45%), cerebral injuries (16%), and bruises (11%). Other injuries were isolated cases.

The injuries registered in 2018–2020 years in cadets were acute (arising from a sudden, severe, traumatic event), requiring organization of first aid and/or further delivery to the clinic [7]. Other injuries (chronic, associated with a repeated physical activity) were not registered by the medical unit.

To observe other experience of injuries and occurrence of pain syndromes, survey of cadets of 1st, 2nd and 3rd years of studying was conducted (Table 2). The average age of first year respondents was 18.5 ± 2.2, second year – 19.3 ± 1.76 and third – 21.1 ± 2.8. An average body mass index was within the age norm, 22.36 ± 2,3 kg/m².

Table 1. Numbers of cadets, who got injured in the period of 2018-2020, accroding to the Academy data

Type of injury	Number of injuried n (%)
Fracture	24 (45%)
TBI	9 (16%)
Bruises	6 (11%)
Burns	3 (6%)
Stab and slash wound	2 (4%)
Concussion	2 (4%)
Polytrauma	2 (4%)
Traumatic amputation	2 (4%)
Sprain	1 (2%)
Poisoning	1 (2%)
Ligament tear	1 (2%)
Total	53

The presence of unhealthy habits was indicated by 68% of respondents, from whom 58% mentioned tobacco smoking. Among other harmful habits, cadets of the first year indicated consumption of energy drinks, scratching the wounds, biting nails. The combination of tobacco smoking and alcohol consumption was indicated by 2 first-year cadets, 5 second-year cadets and 7 third-year cadets.

In 75% of cases, respondents had previous experience in performing sports: with a coach, in a sports team or club before entering the Academy. Only 25% of respondents did not have such experience.

Among the respondents, 141 (55%) indicated the occurrence of injury and/or pain syndrome during training (Table 3). The total number of injuries and pain syndromes mentioned by cadets was 246 cases, 93 (38%) of which were in cadets of the first, 58 (23%) – the second and 95 (39%) – the third year of studying. According to the localization of injury and pain syndromes, the complaints of injuries in lower limbs were in 86 (35%) cadets; 36 (15%) indicated having experience of injury in upper limbs, 62 (25%) – in back, 27 (11%) – in head, 17 (7%) in neck, 12 (5%) – in abdomen, 6 (2%) mentioned having experience of injury/pain syndromes in chest.

Out of 141 people with complaints of pain or injury, only 72 (51%) respondents consulted a doctor. For 55 (76.3%) of them, treatment was prescribed and in 51 (70.8%) of cases recommendations for self-management were given.

During training at the Academy, 15% of respondents had experience of injuries and pain syndromes in upper limbs, which, along with a significant amount of physical exertion, mainly using the upper limbs (in particular, pressing-out, pull-ups, grenade throwing, low crawling, competing in sports), prompted to analyze the intensity of pain that occured in them (Table 4). It was observed that 41 (16% out of total number of respondents) cadets had pain in upper limbs during recent month; 20 people (49%) described it as moderate, 16 (39%) – as mild, 5 (12%) – as severe.

Table 2. Sociodemographic characteristics of cadets of high military educational institution

Characteristics	Cadets			
	Total (n=256) n (%)	1st year (n=79) n (%)	2nd year (n=90) n (%)	3rd year (n=87) n (%)
Age, M±SD, years	19.73±2.53	18.57±2.2	19.39±1.76	21.16±2.8
Body height, M±SD, cm	179.32±6.62	180.3±6.71	179.29±7.26	178.42±5.73
Body mass, M±SD, kg	72.24±7.56	71.51±7.19	72.65±8.71	72.54±6.61
BMI, M±SD, kg/m^2	22.36±2.3	21.99±1.54	22.56±2.03	22.5±3.03
Marital status:				
– single	248 (97%)	75 (95%)	88 (98%)	85 (98%)
– married	8 (3%)	4 (5%)	2 (2%)	2 (2%)
Children:				
– yes (present)	4 (1%)	0	1 (1%)	3 (4%)
– none	252 (99%)	79 (100%)	89 (99%)	84 (96%)
Presence of unhealthy habits:				
– cadets, who indicated having such	162 (63%)	45 (57%)	57 (63%)	60 (69%)
– smoking (tobacco, hookah, GLO)	148 (58%)	42 (53%)	52 (57%)	54 (62%)
– alcohol consumption	26 (10%)	2 (3%)	11 (12%)	13 (15%)
– other	3 (1%)	3 (4%)	0	0
Military service experience before studying in the Academy:				
– yes	51 (20%)	14 (18%)	15 (17%)	22 (25%)
– no	205 (80%)	65 (82%)	75 (53%)	65 (75%)
Performing sport (with a couch, in team, sports club) before entering the Academy:				
– yes	192 (75%)	67 (85%)	66 (73%)	59 (68%)
– no	61 (25%)	9 (15%)	24 (27%)	28 (32%)
VEL, M±SD, hrs	1006.04±912.17	884.33±857.77	1132.11±1067.65	1003.02±756.47

Notes: M – the mean; SD – standard deviation; BMI – body mass index; GLO – tobacco heating system; Academy – high military educational institution, where the research was conducted; VEL – volume of exercise load

DISCUSSION

This study is the first to quantitatively assess experience of injury and pain in cadets of the HMEI of Ukraine, the general structure of injuries and to qualitatively analyze the occurrence of pain syndromes in upper limbs. A retrospective cohort study was conducted on the basis of self-reported answers. The possibility of using the current research design and high accuracy of the data obtained in comparison with medical records is confirmed in the military members` cohort [8].

In 2018–2020, the medical unit of the Academy registered 53 acute injuries of cadets, among which 45% accounted for fractures of various anatomical areas. According to the data by foreign authors, proportion of acute injuries in cadets, recruits and military personnel-during training and studying equals in range from 22% to 44% [3, 5]. Most traumas were overuse injuries, data on which in Ukrainian cadets were not available.

The sample of studied cadets was homogeneous both in demographic and social characteristics. Only 20% of respondents had experience of previous military service. However, 75% were engaged in various sports with the coach, club, team or section before admission to the Academy. An average volume of exercise load for the entire training period was 1006.04 ± 912.17 hours.

The general frequency (55% of cadets) and prevalence of injuries and pain syndromes by localization in anatomical areas in the study were similar to those described in other studies in military [8, 9]. A total of 141 cadets experienced at least one injury or pain syndrome during studying and reported 246 such cases. The highest level of injury is found in cadets of the first (60%) and third (61%) years of studying.

An analysis of localization structure of injuries and pain syndromes found that the most common in cadets of all studied years were lower limbs` injuries (35% of the total number of injuries indicated by the respondents), back injuries (25%) and upper limbs` injuries (15%). This coincides with study [9] on the severity and prevalence of injuries in anatomical areas, but the level of distribution of upper limb injuries in various studies depends on the specifics of professional activity. In particular, 12.4% of injuries to various anatomical areas of the upper limb were reported by military personnel occuring during their sports training; increasing of injuries to 16.7% occurred during sports activity in spare time [9]. At the same time, police officers who, according to physical training requirements, are similar to military personnel, reported significantly higher risks of shoulder (20%) or any area of the upper limb injury (39.4%) [10]. In addition, it was

Table 3. Clinical profile of cadets and their experience of injury and pain syndromes during training

Characteristics	Cadets			
	Total (n=256) n (%)	1 year (n=79) n (%)	2 year (n=90) n (%)	3 year (n=87) n (%)
Total number of cadets, who indicated experience of injury and/or pain syndrome(s)	141 (55%)	48 (60%)	40 (44%)	53 (61%)
Total number of injuries and/or pain syndromes, indicated by cadets	246	93	58	95
Localization of injury or pain syndrome occurred during all studying period in Academy:				
– lower limbs	86 (35%*)	27 (29%*)	23 (40%*)	36 (38%*)
– upper limbs	36 (15%*)	16 (17%*)	7 (12%*)	13 (14%*)
– back	62 (25%*)	26 (28%*)	15 (26%*)	21 (22%*)
– head	27 (11%*)	10 (11%*)	4 (7%*)	13 (14%*)
– neck	17 (7%*)	6 (6%*)	3 (5%*)	8 (8%*)
– abdomen	12 (5%*)	6 (6%*)	4 (7%*)	2 (2%*)
– chest	6 (2%*)	2 (2%*)	2 (3%*)	2 (2%*)
Consulting doctor on the injury or pain syndrome occurred:				
– yes	72 (51%**)	19 (39%**)	21 (52%**)	32 (60%**)
– treatment prescribed	55 (39%**)	10 (21%**)	20 (50%**)	25 (47%**)
– recommendations on further self-management	51 (36%**)	10 (21%**)	17 (42%**)	24 (45%**)

*Notes: * – the percentage was determined at the ratio of the total number of injuries and/or pain syndromes indicated by cadets; ** – the percentage was determined at the ratio of the total number of cadets, who indicated injuries and/or pain syndromes occurrence*

Table 4. Pain intensity in cadets that occured in upper limbs in the last month of studying year

Pain intensity	Cadets			
	Total (n=256) n (%)	1 year (n=79) n (%)	2 year (n=90) n (%)	3 year (n=87) n (%)
Number of suffered	41 (16%)	22 (28%)	12 (13%)	7 (8%)
Mild	16 (39%*)	7 (32*)	6 (50%*)	3 (43%*)
Moderate	20 (49%*)	14 (64*)	3 (25%*)	3 (43%*)
Severe	5 (12%*)	1 (6*)	3 (25%*)	1 (14%*)
Intense	-	-	-	-
Intorelable	-	-	-	-

*Note: * – the percentage was determined at the ratio of the total number of cadets, who mentioned occurrence of pain in upper limbs during recent month*

found that longer periods out of service may be associated with injuries of upper limbs: shoulder joint (after 26.1±28.3 days), and hand (after 17.0±29.3 days) injuries [9], compared to indeces of injuries of lower limbs (knee – after 15.7 ±29.8 days, ankle joint – after 15.6±17.8 days).

It should be noted that level of injury of lower limbs and back tends to increase in senior cadets, and the level of injury in upper limbs is maximum in cadets of the first year of studying. As for the injuries of other anatomical areas (head, neck, abdomen, chest), such tendencies are not followed.

It is important to note that this study revealed a low level of consulting a doctor in case of injuries or pain syndromes in cadets. On average, only 51% of the respondents consulted a doctor, 39% of them were cadets of the first year of studying, 52% – of the second and 60% - of the third. The cause of this behavior in cadets was not clear, but it can have negative consequences on the course of injury, the quality of cadets` life and service, and contribute to the occurrence of complications.

A month before the survey, 16% of the respondents complained of pain in upper limb, including 39% of first-years, 13% – of second and 8% – of third-year cadets. The intensity of this pain in 49% of cases was mild, in 39% – moderate, and 12% – severe (Figure 1).

The results of our study confirm the hypothesis that cadets, during their studies at the HMEI, suffer not only acute injuries, but also chronic, cumulative injuries, in particular, of the upper limbs. The cause of such injuries is, oftenly, repeated micro-injuries, rather than isolated cases [11].

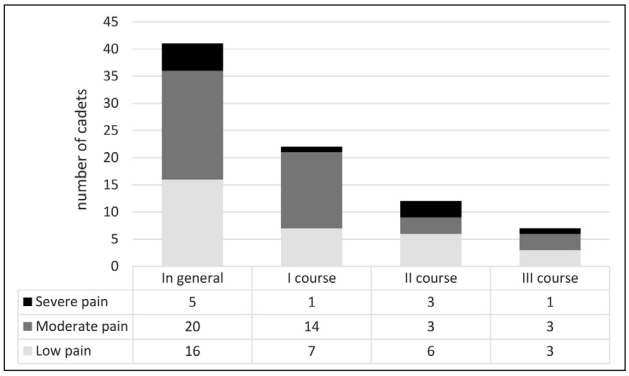


Figure1. Distribution of pain intensity in upper limbs in cadets

Overuse injuries can be prevented, however, risk factors, prevention and treatment strategies` issues are not clarified yet [12]; although, the necessary component for prevention and rehabilitation after such injuries is physiotherapy.

Taking into account the prevalence and structure of injuries and pain syndromes of the upper limbs in cadets of HMEI, lack of proper information in cadets on the need of preventive measures, and risks of deterioration of the level of functioning in absence of proper physiotherapy, programs for prevention and rehabilitation are relevant.

CONCLUSIONS

According to the documents of medicin department for 2018-2020, the main focus on treatment and rehabilitation covers only cadets with acute and severe injuries. Such injuries are registered and make up the basic statistics.

Other injuries (non-acute, chronic injuries and pain syndromes), the occurrence of which is indicated by 55% of respondents of the first, second, and third years of studying, are not registered. Out of 141 respondents, who indicated 246 injuries and pain syndromes in different body parts, only 51% consulted a doctor of the local medical unit concerning these complaints.

The main part of complaints was of injuries and pain syndromes in lower, upper limbs and back. Injuries of the upper limbs in cadets occurred throughout the training period, and in 16% of respondents, pain in the upper limbs was present at a certain period of recent month before the survey and was assessed from weak to severe of intensity.

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