

TREATMENT OF ADULT PATIENTS WITH CRANIOCEREBRAL TRAUMA COMPLICATED BY VENITALORY FAILURE

Jolanta Piskorz^{1,2}, Joanna Hżeczka², Gustaw Wójcik^{3,4}

¹Department of Anesthesiology and Intensive Care,

The Zofia z Zamoyskich Tarnowska Regional Hospital in Tarnobrzeg

²Laboratory of Neurological Rehabilitation, Department of Rehabilitation,
Physiotherapy and Balneotherapy Medical University of Lublin

³Balneotherapy Unit, Department of Rehabilitation,
Physiotherapy and Balneotherapy, Medical University of Lublin

⁴Department of Diagnostic Imaging,
The Zofia Zamoyski Tarnowska Provincial Hospital in Tarnobrzeg

Piskorz J., Hżeczka J., Wójcik G, (2014) *Treatment of adult patients with craniocerebral trauma complicated by ventilatory failure.* Health Problems of Civilization 2 (8), p. 4-9

Summary: This article contains the current state of knowledge on modern methods of treating patients with severe cranio-cerebral injuries, hospitalized in intensive care due to respiratory failure. Severe traumatic brain injury (TBI) can be divided into primary and secondary. Primary brain damage takes place in mechanism of direct injury most often due to an impact. Secondary damage is the result of subsequent disorders of physiological conditions such as ischemia and hypoxia of the brain areas covered by the primary injury. Treatment of patients with severe cranio-cerebral injuries is focused on maintaining proper ventilation, hemodynamic stability and optimal values of intracranial pressure. Maintaining adequate blood flow through brain vessels is necessary to prevent the development of ischemic changes. Respiratory failure develops in these patients by direct injury to the brain in the form of tachypnea, bradypnoea, shortness of breath, sleep apnea, or secondarily to trauma as pneumonia, acute respiratory distress syndrome (ARDS), or pulmonary edema. Mechanical ventilation in patients with TBI seeks to maintain an oxygen partial pressure in the arterial blood of more than 11 kPa and the partial pressure of carbon dioxide in the range of 4.5 to 5.0 kPa. The use of appropriate therapy is to prevent the secondary damage to the brain or reduce complications associated with secondary damage.

Key words: cranio-cerebral trauma, respiratory failure, intracranial pressure

Introduction

Head injuries are the main cause of morbidity and mortality in all age groups. The most common causes. The most common causes of brain injury are motor vehicle accidents, falls, sports injuries, collisions, and assault and violence. Clinical reviews of the European Union show that 40% of traumatic brain injury was the result of traffic accidents (Tagliaferri et al. 2006).

Craniocerebral trauma is accompanied by neuropathological changes that depend on the type and severity of the injury. Neuropathological changes are divided into focal damage such as bruising of brain tissue, hemorrhage, skull fractures and extensive damage, which include diffuse axonal injury, diffuse vascular damage, ischemia and cerebral edema.

The result of brain contusions are intracerebral hematomas, often accompanied by fractures in the area of contusion. This type of damage is usually the result of trauma contrecoup injury of brain and relate to the frontal lobes, orbital surface of the frontal lobes, orbital surface of the frontal lobes, temporal lobes and side surfaces. Severe brain contusions lead to hemorrhage into the brain parenchyma and increased intracranial pressure.

Another consequence of brain injury is epidural hematoma. It arises in patients with severe head injury, usually accompanied by fracture of the temporal bone husks and tear the middle meningeal artery. The volume of hematomas than 150 ml is a poor prognostic factor (Stienen M et al. 2013).

Address for correspondence: Jolanta Piskorz, Medical University of Lublin, Al. Raławickie 1, 20-059 Lublin, e-mail: jolapis@op.pl
phone 506-113-385

Tables: 0, **Figures:** 0, **References:** 30, **Full text PDF** www.hpc.edu.pl **Copyright** © Pope John Paul II State School of Higher Education In Biała Podlaska, Sidorska 95/97, 21-500 Biała Podlaska **Indexation:** Index Copernicus, Polish Ministry of Science and Higher Education. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-commercial License (<http://creativecommons.org/licenses/by-nc/3.0>), which permits use, distribution, and reproduction in any medium, provided the original work is properly cited, the use is non-commercial and is otherwise in compliance with the license.

Subdural hematoma is caused by the rupture of connecting veins, especially those in the vicinity of the upper bay fibula. Most often it is the result of rapid acceleration or inhibition of the head. Subdural hematomas are divided into acute when formed shortly after the injury, sub-acute appearing 1-2 weeks after injury, and chronic when there are more than two weeks after the injury. Patients of Intensive Care Unit are usually hospitalized with acute subdural haematomas after surgical decompression of the hematoma.

Often, brain contusions and rupture are accompanied by accumulation of blood in the sub-arachnoid space. Massive sub-arachnoid hemorrhage can occur due to rupture of the vertebral artery, basilar artery of the brain or another. This event is often fatal (Gerald et al. 2014).

Cerebral edema occurs commonly in patients with cranio-cerebral injuries. There is a vasogenic edema, brain injury as a result of cerebral vasodilation in which there is an increase in blood volume flowing through the brain or to leakage of cerebrospinal fluid as a result of failure of the blood-brain barrier. Cytotoxic edema occurs when there is an increase in intracellular water content of the central nervous system. Cerebral edema is the cause of raised intracranial pressure and cerebral blood flow pressure drop, leading to ischemic brain damage.

Trauma, hypoxia, ischaemia and hypoglycaemia, often lead to the destruction of axons within the brain. Patients with diffuse traumatic axonal are unconscious, and the prognosis is poor. Most end up fatal or serious injury or permanent vegetative state (Sullivan et al. 2013).

Selected treatment of patients with cranio-brain injuries

Intensive treatment of patients with severe brain injuries includes elements of surgical and conservative treatment. Cerebral ischemia is the most important secondary factor that influences the outcome. To maintain the normal range of brain perfusion pressure, the correct mean arterial pressure must be provided. It is indicated for hemodynamic stability and avoidance of hypotension through proper filling of the vascular bed. Isotonic crystalloid and colloid are applied, and if necessary, blood decongestants (Johnston et al. 2004).

In post-traumatic intracranial pressure monitoring (ICP) appropriate sedation, analgesia and muscle relaxants as needed play a crucial role. Most of sedative act as an anticonvulsant. Muscle relaxants affect the optimization of the mechanical ventilation in patients with severe traumatic brain injuries, minimize coughing and muscle tone which are responsible for, inter alia, the increase of ICP. The most common drugs used for sedation is propofol and short acting benzodiazepine - midazolam. They cause a dose-dependent reduction of cerebral oxygen metabolism and cerebral blood flow (Johnston et al. 2003). Propofol acts quickly and briefly, therefore, allows for rapid assessment of the neurological status of the patient. It is given as a continuous infusion. It has a beneficial effect on the intracranial homeostasis, does not interfere with the mechanism of autoregulation of cerebral circulation and cerebral vascular reactivity in response to the change of carbon dioxide (Tobias 2000). While using of propofol, there may, however, occur a cardio-respiratory collapse and the propofol treatment syndrome (Kumar et al. 2005).

In the treatment of patients with brain injuries, a very important aspect is pain therapy. Suitable doses of paracetamol, and opioids provide analgesia to such extent to avoid increased ICP. The most commonly used are: morphine, fentanyl and remifentanyl. Fentanyl and remifentanyl have short duration but a continuous infusion of fentanyl results in accumulation in tissues and remifentanyl has a half-life of less than 5 min, therefore, does not accumulate.

Barbiturates are another group of agents used in the treatment of severe cranio-cerebral. They reduce ICP, decrease the metabolism of the brain, impair vascular hemodynamics, reduce cellular acidosis (Mansour et al. 2013). The infusion of barbiturates, especially in large doses is a cause of hypotension due to impaired venous return, baroreceptor reflex inhibition and a depressive effect on the heart muscle, therefore their use should be cautious and justified by refractory intracranial pressure that does not respond to any other treatment.

Patients with severe brain injuries require respiratory support with mechanical ventilation. Mechanical ventilation should be included in the early stages of cranio-cerebral treatment to avoid hypoxemia and hypercapnia, which secondarily leads to the development of intracranial hypertension (Ghajar, 2000). One have to choose the kind of mechanical ventilation to maintain oxygen tension and carbon dioxide in the arterial blood within the normal range. Patients after neurosurgical and trauma surgeries of the skull or brain tumors usually have increased ICP. Using ventilation with positive pressures, especially PEEP (positive pressure ventilation with end-tidal) decreases venous return from the head which leads to an increase in ICP. Another mechanism that leads to disruption of cerebral blood flow during ventilation with PEEP is a decrease in cardiac output and, consequently, a decrease in mean arterial pressure and cerebral perfusion pressure (Caricato et al. 2005). When the value of the ICP is high, ventilation with PEEP should be carefully used. Helmy et al. reported that PEEP to 12 cm H₂O does not cause a dangerous increase in ICP (Helmy et al. 2007).

In clinical practice, in order to reduce ICP hyperventilation applies also to bring about a drop in the pressure of carbon dioxide in arterial blood. Lowering PaCO₂ causes cerebral vasoconstriction and parallel decrease in cerebral blood flow and the ICP. This practice by is not recommended by many authors, because vasoconstriction due to hypocapnia may worsen cerebral ischemia and cause cerebral lactic acidosis. (Solaiman, Singh 2013). In addition, if you are trying to restore the value of PaCO₂ by reducing hyperventilation, there may be an increase in ICP with reflection, which results in excessive blood supply to the brain tissue as a result of reperfusion injury and in places previously ischemic bleeding may occur (Marik et al. 2002).

In the treatment of cranio-cerebral trauma, in order to reduce the ICP osmotic diuretics and concentrated solutions of sodium chloride are applied. Mannitol is currently only used osmotic diuretic. After intravenous use no back-flow is absorbed in the renal tubules, depending on the osmotic pressure, the water is stopped in the light of the channel and the diuresis is increased. With the intact blood-brain barrier, mannitol creates the osmotic gradient and the displacement of water from the vascular compartment reduces brain swelling. At osmolarity more than 320 mOsm / l supply of this drug is contraindicated because it increases neurological and renal side effects (Ye, Su 2013).

Hypertonic sodium chloride solution has an osmotic effect by displacing the water in accordance with the osmotic gradient from the brain parenchyma into the intravascular space, so the tissue pressure is decreased, cell size, and thereby, the swelling of the brain is reduced (Diringer 2013).

Patients with cranio-cerebral injuries often suffer from cardio-respiratory and systemic complications. The cause of them is direct brain injury and concomitant injuries and complications of treatment. Zyguan et al argue that the failure of one organ is associated with a mortality rate of about 40%, in case of failure of two organs increases to about 47%, and if the damage is three or more bodies mortality reaches 100% (Zyguan et al. 2005).

Cardiovascular complications after brain injuries occur in the form of hemodynamic instability, relative hypotension, which requires the use of vasoactive agents in the treatment and in the form of disturbances in heart rhythm, often requiring urgent intervention (supraventricular tachycardia, ventricular fibrillation). Acute cardiac failure while brain injury is probably secondary to the accompanying increase in the concentration of catecholamines [Macmillan et al. 2002]. The commonly used drugs are vasoactive epinephrine, norepinephrine, dopamine and dobutamine. Sympathomimetics are working on the principle of stimulation of naturally occurring adrenergic receptors. They are used to increase the mean arterial blood pressure and cerebral perfusion pressure, as well as in patients who developed neurogenic pulmonary edema, myocardial dysfunction and organ failure. Before using vasoactive drugs, one should always rule out hypovolemia and make up the volume of circulating blood. Recommendations of Brain Trauma Foundation in 2007 are such that brain perfusion pressure ought be maintained at 50-70 mmHg but aggressive maintaining this pressure above 70 mmHg by using fluids and vasoactive drugs is not recommended due to the increased incidents of respiratory distress syndrome (The Brain Trauma Foundation, 2007).

Neurogenic pulmonary edema is another consequence of brain injury. The treatment in this case is based on the use of oxygen therapy, ventilator support with respirator, and dobutamine which improves function of left ventricular. Diuretics and nitrates should be used with caution, as they cause a reduction in blood pressure, and decrease in blood and cerebral perfusion pressure (Scalf et al. 2013).

Patients with traumatic brain injury often have respiratory complications in the form of pneumonia, choke and ARDS (Acute respiratory distress syndrome). Pneumonia develops in these patients as a result of different mechanisms, the most common are: aspiration of secretions from the nasopharynx in patients in a coma, elderly age, carrier state of *Staphylococcus aureus*, the infusion of drugs that cause sedation and barbiturates, which have a immunosuppressive effect. In the treatment of pulmonary inflammation, the most important is early targeted antibiotic therapy, the use of tubes for intubation with the gasketing cuffs of small volume and low pressure, which prevent microaspiration (Young et al. 2006).

ARDS is a severe lung injury where PaO₂/FiO₂ ratio is less than 200. ARDS is a common complication in patients with brain injuries, associated with a higher risk of death and neurological complications. Therapy involves, inter alia, the use of so-called. saving ventilation, which means the use of small tidal volumes to avoid over-expansion pulmonary barotrauma and decrease in systemic pressure, because the lungs in ARDS are functionally small (Petrucci, Iacovelli 2004).

Modern methods of preventing cranio-cerebral trauma complications

The result of treatment of patients with cranio-cerebral trauma is undoubtedly great influenced by primary brain injury severity, but many factors that occur in the post-trauma phase contribute to traumatic secondary brain damage. Secondary damage worsens morbidity and increases mortality. Intracranial hypertension, hypoxemia, hypocapnia, systemic hypotension, fever, hyperglycemia and hypoglycemia are the factors that secondarily damage brain. Suitable treatment of patients with traumatic brain injury is the basis of a neurological intensive care.

Yan E and et al. on the basis of tests carried out in 44 patients with traumatic brain injury show that in secondary hypoxic brain involves greater production of cytokines and growth levels of biomarkers in serum, which is associated with chronic neurogenic inflammation and correlates with poor prognosis (Yan et al. 2013).

It has long been believed that the cooling of the patients has a neuroprotective effect. Body temperature in the range of 36.50 to 37.50 C C allows to maintain proper homeostasis. CNS temperature below 35°C is defined as hypothermia. Implementation of hypothermia in the treatment of patients with brain injuries is controversial, but it is used due to the effect of decreasing the ICP (Polderman et al. 2002). Farag E et al in their work, report that use of hypothermia in patients with traumatic brain injury in secondary trauma treatment is not recommended. In contrast, it is important to maintain normothermia and avoid hyperthermia (Farag et al. 2011).

Secondary brain damage is caused by intracranial hypertension and cerebral edema. One of the methods of treatment of cerebral edema is the use of osmotically active agents. The most used are mannitol and hypertonic sodium chloride solution. Aside from decreasing ICP, they also improve the blood supply to the brain and improve the conditions for the distribution of oxygen. There are studies that prove that it seems preferable to use hypertonic sodium chloride solution than mannitol, as in patients with multi-organ injuries contributes to hemodynamic stability and prevent secondary complications. Furthermore, concentrated solutions of salts have the neurohumoral and immunological effect, which may be beneficial in the brain resuscitation (Grape, Ravussin 2012).

Grande and Romner in their work draw attention to the need for osmotherapy to prevent acute compression of the brain stem until the decompressive procedures are performed, for instance, craniotomy evacuating the hematoma. In contrast, the routine use of a hypertonic solution of mannitol and sodium chloride is not favorable due to a number of complications, inter alia, electrolyte disturbances, renal failure progression, rebound increase in ICP after discontinuation of the infusion of osmotically active factors (Grand, Romner 2012).

If there is damage to the blood-brain barrier, mannitol supply leads to cerebral edema and axonal destruction by the disintegration of myelin sheaths. P. Kozler et al conducted a study which shows that in such cases, used intravenous methylprednisolone can effectively reduce the damage to axons (Kozler et al. 2011).

The development of respiratory complications in patients with traumatic brain injury is quite often. ARDS is a severe lung damage associated with high mortality. There are many methods for the treatment of acute respiratory distress syndrome. One of the methods less commonly chosen due to low availability of such respirators is the high frequency ventilation (HFV). Vrettou et al show advantages in comparison with a conventional mechanical ventilation (CMV). They measured the effect on the pressure of oxygen and carbon dioxide in the arterial blood, systemic hemodynamics, ICP, and the pressure of cerebral perfusion in patients with traumatic brain injury. These researchers concluded that the use of HFV in patients with ARDS with traumatic brain injury improved oxygenation and respiratory mechanics without negative impact on PaCO₂, hemodynamics and ICP (Vrettou et al. 2013).

Very important in the treatment of patients with cranio-cerebral injuries is leveling fluid and electrolyte and metabolic disturbances. Levelling of water and electrolyte balance is to maintain homeostasis. Patients should be adequately hydrated to maintain normal plasma volume, left ventricular filling pressure, cardiac output and blood pressure and adequate tissue oxygenation. The purpose of such treatment is to prevent the secondary damage to neurons due to insufficient supply of tissues with oxygen. Clifton et al in their work found that maintaining a negative fluid balance below -594 ml in a day is associated with a worse prognosis. There is no reliable data indicating justification of the validity limit fluid intake in patients with head injury in order to reduce swelling of the brain (Clifton et al. 2002). Maintaining of normovolemia and normal physiological indicators on cerebral blood flow is essential in the treatment of these patients.

Conclusions

- 1 Treatment of patients with severe cranio-cerebral injuries is focused on maintaining normal intracranial pressure, ensuring adequate ventilation and hemodynamic stability.
- 2 Respiratory failure develops in these patients as a result of direct injury to the brain in the form of tachypnea, bradypnoea, shortness of breath, sleep apnea, or secondary to trauma as pneumonia, ARDS or pulmonary edema.
- 3 Maintaining normal cerebral blood flow is necessary to prevent the development of ischemic changes.
- 4 The use of appropriate therapy is to prevent secondary brain damage or reduce the complications associated with secondary damage.

References:

1. Caricato A., Conti G., Delia Corte F., Mancino A., Santilli F., Sandroni C. (2005), *Effect of PEEP on the intracranial system of patients with head injury and subarachnoid hemorrhage: the role of respiratory system compliance*. *Trauma*. 58(3): s. 571-576.
2. Clifton GL., Miller ER., Coi SC., Levin HS. (2002), *Fluid thresholds and outcome from severe brain injury*. *Crit Care Med*. 30(4): s. 739-745.
3. Diring M.N. (2013), *New trends in hyperosmolar therapy*. *Curr Opin Crit Care*. 19(2): s. 77-82.
4. Farag E., Manno EM., Kurz A. (2011), *Use of hypothermia for traumatic brain injury: point of view*. *Minerva Anesthesiol*. 77(3): s. 336-370.
5. Geraldes R., Sousa P.R., Fonseca A.C., Falcao F., Canhao P., Pinho E., Melo T. (2014), *Nontraumatic convexity subarachnoid hemorrhage: Different etiologies and outcomes*. *Journal of Stroke and Cerebrovascular Diseases*. 23(1): s. 23-30.
6. Ghajar J. (2000), *Traumatic brain injury*. *Lancet*. 356: s. 923-929.
7. Grape S., Ravussin P. (2012), *PRO: osmotherapy for the treatment of acute intracranial hypertension*. *J Neurosurg Anesthesiol*. 24(4): s.402-406.
8. Gründe PO., Romner B. (2012), *Osmotherapy in brain edema: a questionable therapy*. *J Neurosurg Anesthesiol*. 24(4): s. 407-412.
9. Helmy A., Vizcaychipi M., Gupta AK. (2007), *Traumatic brain injury: intensive care management*. *Br J Anaesth*. 99(1): s. 32-42.
10. Johnston AJ., Steiner LA., Chatfield DA. (2003), *Effect of propofol on cerebral oxygenation and metabolism after head injury*. *Br J Anesth*. 91: s. 781-786.
11. Johnston AJ, Steiner LA, Chatfield DA. (2004), *Effect of cerebral perfusion pressure augmentation with dopamine and norepinephrine on global and focal brain oxygenation after traumatic brain injury*. *Intens Care Med*. 30: s. 791-797.
12. Kozler P., Riljak V., Pokorný J. (2011), *Methylprednisolone reduces axonal impairment in the experimental model of brain oedema*. *Neuro Endocrinol Lett*. 32(6): s. 831-835.
13. Kumar MA., Urrutia VC., Thomas CE., Abou-Khaled KJ. (2005), *The syndrome of irreversible acidosis after prolonged propofol infusion*. *Neurocrit Care*. 3: 257-259.
14. Macmillan CS., Grant IS., Andrews PJ. (2002), *Pulmonary and cardiac sequelae of subarachnoid haemorrhage: time for active management?* *Intens Care Med*. 28: s. 1012-1023.
15. Mansour N., deSouza R.M., Sikorski C., Kahana M., Frim D. (2013), *Role of barbiturate coma in the management of focally induced, severe cerebral edema in children*. 12(1): s. 37-43.
16. Marik PE., Varon J., Trask P. (2002), *Management of head trauma*. *Chest*. 122(2): s. 699-711.
17. Petrucci N., Iacovelli W. (2004), *Ventilation with lower tidal volumes versus traditional tidal volumes in adults for acute lung injury and acute respiratory distress syndrome*. *Cochrane Database Syst Rev*. (2): s. 384-396.
18. Polderman KH., Tjong Tjinoo R., Peerdeman SM., Vandertrop WP., Girbes AR. (2002), *Effect of therapeutic hypothermia on intracranial pressure and outcome in patients with severe head injury*. *Intens Care Med*. 28: s.1563-1567.
19. Scalfani M.T., Dhar R., Zazulia A.R., Videen T.O., Diring M.N. (2013), *Effect of osmotic agents on regional cerebral blood flow in traumatic brain injury*. *J Crit Care*. 27(5): s. 7-12.
20. Solaiman O., Singh J.M. (2013), *Hypocapnia in aneurismal subarachnoid hemorrhage: Incidence and association with poor clinical outcomes*. *Journal of Neurosurgical Anesthesiology*. 25(3): s. 254-261.
21. Stienen M., Abdulazim A., Hildebrandt G., Gautshi O.(2013), *Emergency scenario: epidural hematoma- evaluation and management*. *Praxis (Bern)*. 30: s.102-103.
22. Sullivan G.M., Mierzwa A.J., Kijpaisalratana N., Tang H., wang Y., Song S.K., Selwyn R., Armstrong R.C. (2013), *Oligodendrocyte lineage and subventricular zone response to traumatic axonal injury in the corpus callosum*. *J Neuropathol Exp Neurol*. 72(12): s.1106-1125.
23. Tagliaferri F., Compagnone C., Korsic M. (2006), *A systematic review of brain injury epidemiology in Europe*. *Acta Neurochir (Wien)*. 148: s. 255-268.
24. The Brain trauma Foundation and the Joint section of the American Association of Neurological Surgeons and Congress of Neurological Surgeons on Neurotrauma and Critical Care. (2007), *Guidelines for the Management of Severe Traumatic Brain Injury*. 3rd edition. IX Cerebral Perfusion Thresholds. *J Neurotrauma*. 24: s. 59-64.
25. Tobias JD. (2000), *Propofol: effect on the central nervous system*. *J. Intensive Care Med*. 15(5): s. 237-246.

26. Vrettou CS., Zakyntinos SG., Malachias S., Mentzelopoulos SD. (2013), *High-frequency oscillation and tracheal gas insufflations in patients with severe acute respiratory distress syndrome and traumatic brain injury: an interventional physiological study*. Crit Care. 17(4): s. 136-140.
27. Yan E., Satgunaseelan L., Paul E., Bye N., Nguyen P., Agyapomaa D., Kossmann T., Rosenfeld JV., Morganti-Kossmann C. (2013), *Post-traumatic hypoxia is associated with prolonged cerebral cytokine production, higher serum biomarker levels and poor outcome in patients with severe traumatic brain injury*. J Neurotrauma. 11(26): s. 1146-1160.
28. Ye H., Su Y. (2013), *Hemodynamic effect of mannitol infusion in patients with acute intracerebral hemorrhage*. Acta Cir Bras. 28(2): s. 106-111.
29. Ypung PJ., Pakeerathan S., Blunt MC., Subramanya S. (2006), *A low-volume, low-pressure tracheal tube cuff reduces pulmonary aspiration*. Crit Care Med. 34: s. 632-639.
30. Zyguan DA., Kortbeek JB., Fick GH., Laupland KB., Doig CJ. (2005), *Non-neurologic organ dysfunction in severe traumatic brain injury*. Crit Care Med. 33: s. 654-660.

Submitted: 28.04.2014

Accepted: 06.06.2014

NEUROLOGICAL COMPLICATIONS OF LUMBAR SPINE PAIN SYNDROMES

Gustaw Wójcik^{1,2}, Jolanta Piskorz^{3,4}, Joanna Hżeczka⁴

¹Diagnostic Imaging Department, The Zofia z Zamoyskich Tarnowska Regional Hospital in Tarnobrzeg.

²Balneotherapy Department, Chair of Rehabilitation,
Physiotherapy and Balneotherapy at the Medical University in Lublin

³Department of Anesthesiology and Intensive Care,
The Zofia z Zamoyskich Tarnowska Regional Hospital in Tarnobrzeg

⁴Neurological Rehabilitation Laboratory, Chair of Rehabilitation,
Physiotherapy and Balneotherapy at the Medical University in Lublin

Wójcik G., Piskorz J., Hżeczka J. (2014) *Neurological complications of lumbar spine pain syndromes*. Health Problems of Civilization 2 (8), p. 10-14

Summary: Back pain is a common health problem. Natural degenerative processes reduce its strength, causing symptoms of sciatica, numbness, paraesthesia with muscle weakness and sensory surface, leading to muscle atrophy, inclusive. Degeneration of the intervertebral disc and hernia formation in the first place causing damage to the spinal cord and nerves and spinal facet joints and ligaments become a source of pain spondylogenic. In the case of advanced degenerative changes of the axial movement of the camera conservative treatment is sometimes ineffective, and the chronic nature of the disease and its neurological complications diminish the quality of life and often lead to disability. In order to reduce the time the patient recovers minimally invasive procedures are used, the effectiveness of which can sometimes vary depending on the location of the source of the pain. **PURPOSE OF THE WORK** is to present the possible neurological complications resulting from chronic spinal pain syndromes. **MATERIAL AND METHODS:** Data were from the PubMed database of the last 20 years, presented in a descriptive analysis. **CONCLUSIONS:** lower back pain make a huge therapeutic difficulties.

Key words: back pain, spinal cord compression, radiculalgia, lumbar disc herniation

Introduction

Lower back pain is a very common health problem. Lack of physical activity, chronic stress, overweight and overloading the spine make back pain become one of the diseases of civilization. In addition to these environmental factors, another cause of back pain are natural degenerative processes within the intervertebral discs, which reduce the strength of the spine and reduce its load carrying capacity. The most common pain syndromes of back-root pain include lumbosacral pain (lumbalgia, sacralgia, radiculalgia).

The type of pain depends on the irritation of one of the two neural systems: core or nerve roots. Irritating these systems triggers the most common symptoms of sciatica, numbness or paresthesias in the extremities, muscle weakness and sensory superficial and leads to muscle atrophy.

Degeneration of the intervertebral disc is very common, and their incidence increases with age. This has important implications since degeneration of the intervertebral disc is very often a prelude to the herniated disc, which can cause damage to the spinal cord, spinal nerves, or both structures at the same time (Vangelder et al. 2013).

Most pathological changes concern the intervertebral disc and facet joints, but they may also be in the ligaments and muscles joints becoming a source of changes around spinal areas. Hypertrophy and fibrosis of the yellow ligament is one of the major causes of stenosis of the lumbar spine. Brown's scale identifies a number of reasons for lower back pain but because of the clinical symptoms of neurological complications spondylogenic and neurogenic causes are important. Spondylogenic ones are initiated by damage of the intervertebral disc due to osteo-articular changes. Neurogenic ones are the result of irritation of the nerve roots (Zhang et al. 2013).

Adress for correspondence: Gustaw Wójcik, Medical University of Lublin, Chodźki 6, 20-093 Lublin,
e-mail: gustaww@tlen.pl, phone: +48 (81) 718 75 03

Tables: 0, **Figures:** 0, **References:** 20, **Full text PDF** www.hpc.edu.pl **Copyright** © Pope John Paul II State School of Higher Education In Biała Podlaska, Sidorska 95/97, 21-500 Biała Podlaska **Indexation:** Index Copernicus, Polish Ministry of Science and Higher Education. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-commercial License (<http://creativecommons.org/licenses/by-nc/3.0>), which permits use, distribution, and reproduction in any medium, provided the original work is properly cited, the use is non-commercial and is otherwise in compliance with the license.

The course of the degenerative spine disease is associated with the development of a more or less persistent pain and complications such as damage to the nervous system in the immediate vicinity of the structural changes of the skeletal system. Osteoarthritis of the spine affects a large part of the population in its middle and old age. The chronic nature of the disease and its neurological complications diminish the quality of life and often lead to disability. Treatment and social care are associated with large financial output. To reduce costs and shorten the time of return of the patient to a full recovery, new techniques of minimally invasive treatments for the spine are developed. Their effectiveness largely depends on the correct qualifications for surgery, and on the correct choice of treatment for the patient. To meet the requirements of an effective procedure, the source of pain in the spine needs to be located, as well as the symptoms of dysfunction of the nerve roots need to be skillfully associated with the level at which there is compression of nerve tissue.

One of the most common sources of pain in osteoarthritis disease of the spine is intervertebral disc. The source of pain is mainly in damaged or irritated during loads and movements of the torso fibrous ring, innervated by the end of the sinus nerve cord, also known as reversible nerve (n. sine-vertebralis vs n. recurrens). Pain can be provoked or worsened by changing body position or the burden on the spine, with the accompanying intensification of muscle tone, but without radicular syndrome. This kind of pain also increases whilest prolonged standing or sitting and is felt more in the lumbar region than in the lower limb.

Discogenic pain can be difficult to differentiate from pain coming from the facet joints. An important element of the differential nature is that the pain derived from intervertebral disc does not disappear after blocking the faced joints, while the introduction of physiological NaCl solution under pressure or a contrast medium to the intervertebral disc regenerates fibrosus pain.

Discography as a method in the field of diagnostic imaging allows for the presentation of the inner ring of fibrous joints resulting from cracking of the structure as a result of carrying excessive loads. Imaging methods such as CT or MRI allow for the morphological evaluation and determination of objective changes that can cause neurological deficits. Diagnostic imaging allows for making a decision as to the appropriateness of surgical intervention (Menon 2013).

As in the peripheral joints osteoarthritis disease, the disease process in the spinal area covers especially the facet joints despite the fact that the exit point of this condition is damage to the intervertebral disc. The result of these changes is the weakening of the supporting function of the spine and a destabilization of the intersegmentary links. Tolerance to mechanical stress is reduced, which sensitizes the formation of spine pain. An important role in the development of back pain is played by a richly innervated facet joint capsule traumatized during pathological vertebral sliding movements. Pain originating from the facet joints is dull, diffuse, located locally in the spine area and also may include a proximal portion of the limbs.

The pain is provoked by a change in body position, especially hyperextension, and is exacerbated as a result of mechanical burdens. Actions which are recommended in these cases, such as reducing the burden of the spine, orthotics, painkillers and non-steroidal anti-inflammatory drugs are not always effective, especially in the chronic pain associated with disorders of the spine stability. On the other hand surgical procedure - spinal fusion (fusion of rings) - is an invasive action changing the biomechanical functions of the spine: from the hypermobility of certain segments to completely excluding them from moving. This increases the load on adjacent segments, which take over the lost range of motion and are more exploited, and thus- are usually not free of the degenerative process. Hence the possibility of iatrogenic complications and recurrent pain.

Compression of the nerve tissue depending on the place of occurrence is associated with the presentation of different types of neurological disorders. One of them is caused by the assembly of the cone of the core terminal part of the pathology of spinal cord, called cone. The clinical picture of the syndrome consists of sensory disturbances in the area of skin around the perianal, perigenital areas and the inner surface of the thighs, dysfunctional voiding and sexual function and pain in the affected area. The anal reflex is absent (Campbell et al. 2005). So is the paresis. The etiology is most often traumatic, sometimes vascular.

Purpose of the study

The aim of the study is to present the possible neurological complications resulting from chronic pain syndromes of the lumbar spine.

Material and methods

Method of descriptive analysis was applied. The study was conducted on the basis of an assessment of the PubMed literature from the years 1992 to 2013. The analysis covered the cases of patients with pain due to disc herniation of the lumbar spine as well as spinal stenosis and intervertebral holes causing compression of nerve tissue and an increased risk of neurological deficit. Cases which were analyzed concerned patients treated conservatively and patients undergoing surgical decompression of the nerve tissue.

Discussion

Damage to the intervertebral disc is the starting point for the formation of back pain syndromes. Lumbar spinal stenosis in addition to the neck part of the spine has the largest range of motion, therefore, it is particularly vulnerable to damage to the intervertebral discs. Compression of the intervertebral disc associated with its lowering affects the disorder of the entire mechanics of the motion segment. The resulting from this instability causes changes in load transfer from the upper part of the body by moving the axle load of a large area of the intervertebral discs to the relatively small outgrowths joints. Static disorders of the spine also bring about changes related to the morphology of the intervertebral holes causing stenosis. Reduction of light for the intervertebral holes conflicts with the tissue disrupting the function of the nerve roots and blood vessels. Such anatomical changes in motion segment induce adaptive changes in the adjacent segments of the movement affecting the working conditions of the nervous tissue as well as ligament and muscle (Wójcik et al. 2013)

Therapeutic treatments are designed to restore optimal anatomical components of bone, ligament and muscle conditioning the proper operation of the nervous tissue.

The lumbar segment of the spine is the source of more frequent pain, suffering and disability than any other part of the body. Pain in the lower back may be associated with the decompressing intervention procedures, such as, disk decompression, spinal fusion and vertebroplasty. The subdural steroid injections provide short-term and sometimes long-term pain relief. Percutaneous decompression of a disk is used to treat nerve root caused by intervertebral disc herniation. Spinal fusion is useful in the treatment of pain syndromes in the case of degenerative changes in the facet joints. Percutaneous vertebroplastics provides short- and long-term relief of pain in patients with diseases of the spine. However, careful selection of patients is essential to the success of any of these techniques (Gang et al. 1998).

Many researchers have tried to find a predictive method for assessing the effectiveness of treatment of disc herniation symptoms of sciatica. Rodet et al in their study used the preoperative electromyography (EMG) to assess the prognostic outcome of patients undergoing surgical treatment of intervertebral disc because of the oppression of the nerve roots at the lumbar level. Patients with normal EMG up to 73% after surgery reported pain relief, while in patients with abnormal EMG paresthesias occurred twice as often and more often the relapses of irritation of the nerve roots occurred (Rodet et al. 1999).

Swartz et al reported a case of the patient with unilateral neurogenic calf hypertrophy caused by compression of the right S1 nerve root. Despite the development of neurogenic muscle hypertrophy patient's strength of the gastrocnemius muscle weakened. MRI test was conducted for the patient which confirmed right-sided damage to the intervertebral disc with compression of the S1 nerve root. Decompressing surgery was applied, after which the progressive nature of the symptoms was detained but muscular deficit remained. This confirms the hypothesis that the S1 nerve root dysfunction is a predisposing factor for the development of neurogenic muscle hypertrophy. It signifies that patients with symptoms of unilateral hypertrophy of the calf muscles require a thorough diagnostic evaluation focused on radiculopathy to determine the etiology of asymmetric neuromuscular conditions (Swartz et al. 2002).

Werle et al described also a hypertrophy of the gastrocnemius muscle in 52 - year-old man in the course of severe symptoms of sciatica. Researchers using EMG demonstrated that there are areas of damage, demyelinating innervated by the roots of S1 and S2. They confirmed the relationship between the occurrence of sciatica with hypertrophy of the muscles and at the same time their weakness (Werle et al. 1992).

Kim et al studied the differences in thickness of the transversus abdominis muscle between patients with chronic low back pain and the healthy ones. These studies were conducted on a group of muscles, the activity of which is associated with abdominal pressure yield, causing decrease in volume of the viscera and causing an increase in pressure in the abdominal cavity. This is very important in the mechanism supporting capacity of the lumbar spine, since this greatly reduces muscle tone back, and as a result reduces the size of the pressure level on the joints and intervertebral discs. In their conclusions, the researchers found that patients with chronic low back pain there often occurs transverse abdominal muscle atrophy and only the muscle reaction rate remains at a similar level as in healthy subjects. Disorders in the morphology of the abdominal muscles significantly affect the progression of the disease of the spine (Kim et al. 2013).

Lenoir et al described a case of 42 - year old patient, who two years earlier had undergone spinal surgery due to stenosis of the spine and the emergence of the early symptoms of cauda equina. The operation was completed to the satisfaction from the perspective of disappearance of neurological symptoms. The patient however developed bilateral radiculopathy at L3 and L4 root level. To reduce the symptoms of pain the patient was given at a subdural level of intervertebral space L2/L3 steroids. Injection was made without a damage to the dural sac and without any technical difficulties, however, soon after that the symptoms of paraplegia were observed in the patient. Emergency surgery was performed immediately to release the roots, however, surgical operation proved ineffective. The patient's neurological status remained unchanged. Four days later, the T2 MRI examination showed high signal intensity at the height of the cone of the core. Diagnosis was an ischemic cone. Probably as a result of injection of steroids parent artery supplying the area of the cone core has been damaged (Lenoir et al., 2008).

Bao et al described a case of 26 - year-old woman, who suffered a sharp pain around the thoraco-lumbar region accompanied by hypoesthesia of the right leg. MRI revealed spinal cone compression. The symptoms were unusual because radiculopathy instead of functional disorders of urination and defecation, typical of oppression of cone core presented an image of sciatica that can occur in the course of lumbar radiculopathy (Bao et al. , 2008).

Rougerie et al cite a case of 63 - year-old woman who was admitted to the neurosurgery department because of severe back pain radiating to the right lower limb. The pain appeared after exercise. Physical examination showed pain syndrome with hypoesthesia of the right spine of the anal area. The X-ray demonstrated widening of the intervertebral space L1/L2, which was interpreted as an expansive, intraspinal change. MRI found deformation and displacement of the cauda equina nerve roots by cyst. Due to adhesions of the cyst with a few roots surgical resection was incomplete resulting in persistent radicular pain returned and sphincter disorders remained. Excision of cysts is often incomplete and complicated by frequent risk of recurrence (Rougerie et al. 1999).

Pseudomeningocele usually occur after surgery of the cervical or lumbar spine segment. Although many of them remain asymptomatic, they can cause compression of the spinal cord and nerve roots. Macki et al described a case of 57 - year old woman who underwent laminectomy with discectomia, after which the patient experienced a significant weakness of the lower limbs and difficulty in walking. The conducted MRI revealed the presence of pseudomeningocele causing spinal cord compression. Positive neurological symptoms were caused by compression of the nerve tissue. Surgical treatment of anatomical changes in the spinal canal and epidural anesthesia may be a cause of iatrogenic pseudomeningocele causing myelopathic symptoms (Macki et al. 2013).

Rillardon et al conducted an analysis of long-term functional capacity after surgical treatment of lumbar spinal stenosis. Good results were obtained for the decompression of the nerve root, which was reflected in the cessation of symptoms of neurogenic claudication. Residual lumbalgia was a major problem at the last follow-up. The study found that the dominant factor influencing the functional outcome is the mental attitude of the patient. Other factors that affect the same population were continuing objective neurological disorders. For most patients, surgical treatment of spinal canal stenosis of the lumbar provides good long-term results and patient satisfaction, but the risk of another operation associated with persisting neurological disorders is 10% in the population of patients (Rillardon et al. 2003).

Also research was carried out based on the assessment of pain intensity before surgeries on stenosis of the lumbar spine using analogue scale VAS and disability scale Oswestry Disability Index (ODI). After decompression surgeries within 2 years after the procedure 31% of patients reported recurrence of back pain, and 54% of them reported further pain radiating into the lower extremities. The authors emphasize that the greater the intensity of back pain before surgery the weaker the effects of pain relief after decompression. (Sigmundsson 2013).

In some cases, when there are no anticipated effects of the treatment of chronic back pain and neck, stimulation of the spinal cord is applied. According to Podwal et al. neurostimulation procedure can not show a full effect, since about 40% of patients respond to it in a small degree (Podwal et al. 2013).

Also six cases were described of myelopathic oppression after lumbar surgery, in which patients have reported acute neurologic deterioration between 6 and 10 days after surgery. Patients reported progressive weakness of the lower limbs of a radiculopathy, or cauda equina injury (Fushimi et al. 2013).

Lykissas et al compared the efficacy of treatments using recombinant bone morphogenetic protein (BMP-2) to stabilize after the discectomia treatments using endogenous material. It was found, however, that treatments using BMP-2 are subject to an increased risk of neurological deficit (loss of sensory and motor function) due to the induction of bone formation at ectopic sites causing damage to nerve tissue (Lykissas et al. 2013).

Most neurological complications are an indication for the next operation, especially when associated with damage in and around nerve roots of the spinal cord. However, they may be irreversible, and sometimes dramatic. Common complications result from complications within the roots of the peripheral nerves and part of them concerns meningeal complications including paraplegia due to spinal complications. Currently, emphasis is placed on efforts to tackle the development of complications, which are particularly dangerous in terms of damage to the core. Their consequences are serious and their state depends on the severity of neurological syndrome. The use of less invasive techniques significantly reduces the incidence of these complications (Michel 1995).

Conclusions

1. Pain in lower spine area causes enormous diagnostic and therapeutic difficulties.
2. Occurrence of pain not responding to conservative treatment should lead to considering the possibility of surgery, but also it does not give full guarantee of cure, as it increases the risk of complications.
3. The greater the severity of pain in the lumbar spine before surgery, the weaker the results of treatment and the more frequent complications.

References:

1. Bao XY, Ding XH., Lu YC. (2008), *Sparganosis presenting as radiculalgia at the conus medullaris*. Clin Neurol Neurosurg. 110(8): s. 843-846.
2. Fushimi K., Miyamoto K., Hioki A., Hosoe H., Takeuchi A., Shimizu K. (2013), *Neurological deterioration due to missed thoracic spinal stenosis after decompressive lumbar surgery: A report of six cases of tandem thoracic and lumbar spinal stenosis*. Bone Joint J. 95(10): s. 1388-1391.
3. Gangi A., Dietemann JL., Mortazavi R., Pflieger D., Kauff C., Roy C. (1998), *CT-guided interventional procedures for pain management in the lumbosacral spine*. Radiographics. 18(3): s. 621-633.
4. Kim KH., Cho SH., Goo BO., Baek IH. (2013), *Differences in Transversus Abdominis Muscle Function between Chronic Low Back Pain Patients and Healthy Subjects at Maximum Expiration: Measurement with Real-time Ultrasonography*. J Phys Ther Sci. 25(7): s. 861-863.
5. Lenoir T., Deloin X., Dauzac C., Rillardon L., Guigui P. (2008), *Paraplegia after interlaminar epidural steroid injection: a case report*. Rev Chir Orthop Reparatrice Appar Mot. 94(7): s. 697-701.
6. Lykissas MG., Aichmair A., Sama AA, Hughes AP, Lebl DR., Cammisa FP., Girardi FP. (2013), *Nerve injury and recovery after lateral lumbar interbody fusion with and without bone morphogenetic protein-2 augmentation: A cohort-controlled study*. Spine J. s. 1654-1659.
7. Macki M., Lo SF, Bydon M., Kaloostian P., Bydon A. (2013), *Post-surgical thoracic pseudomeningocele causing spinal cord compression*. J Clin Neurosci. 5: s. 967-973.
8. Menon KV, Raniga SB., Al Busaidi AQ. (2013), *MRI Morphology of surgically treated lumbar canal stenosis: A retrospective study*. J Spinal Disord Tech. 11(21) s. 276-281.
9. Michel CR. (1995), *Neurologic complications of surgery for spinal deformities*. Chirurgie. 120(11): s. 36-38.
10. Podwal J., Georgy MM., Georgy BA. (2013), *Spinal cord stimulators in an outpatient interventional neuroradiology practice*. J Neurointerv Surg. 10(22): s. 109-114.
11. Rillardon L., Guigui P., Veil-Picard A., Slulittel H., Deburge A. (2003), *Long-term results of surgical treatment of lumbar spinal stenosis*. Rev Chir Orthop Reparatrice Appar Mot. 89(7): s. 621-631.
12. Rodet D., Berthelot JM., Maugars Y., Prost A. (1999), *Prognostic value of preoperative electromyography for outcome of lumbosacral radiculopathy of discal origin*. Presse Med. 28(37): s.2031-2033.
13. Rougerie C., Chazerain P., Arthuis F., Chicheportiche V., Ziza JM. (1999) *Spinal neurenteric cyst revealed by a cauda equina syndrome*. Presse Med. 6;28(5): s. 229-230.
14. Sigmundsson FG., Jönsson B., Strömquist B. (2013), *Preoperative pain pattern predicts surgical outcome more than type of surgery in patients with central spinal stenosis without concomitant spondylolisthesis: A register study of 9051 patients*. Spine (Phila Pa 1976), 10(29): s. 3451-3457.
15. Swartz KR., Fee DB., Trost GR., Waclawik AJ. (2002), *Unilateral calf hypertrophy seen in lumbosacral stenosis: case report and review of the literature*. Spine (Phila Pa 1976). 27(18): s.406-409.
16. Vangelder LH., Hoogenboom BJ., Vaughn DW. (2013), *A phased rehabilitation protocol for athletes with lumbar intervertebral disc herniation*. Int J Sports Phys Ther. 8(4): s. 482-516.
17. Werle C., Kuntz JL., Ruh D., Mohr M., Wiederkehr JP, Bloch JG., Asch L. (1992), *Sciatic radiculalgia with muscular hypertrophy*. Rev Rhum Mal Osteoartic. 59(9): s. 567-570.
18. Campbell WW, DeJong RN, Haerer AF. (2005), *DeJong's the neurologic examination*, Ed. 6. Lippincott Williams & Wilkins, s. 485-486.
19. Wójcik G., Bulikowski W., Piskorz J., Stawińska T., Sokołowska B. (2013), *Computed tomography and stretch tests in diagnosing sciatica as a method for ensuring patient well-being*. Health and wellness. Sci. ed. Wiesław Kurlej, Lublin, NeuroCentrum. s. 223-235.
20. Zhang K., Sun W., Liu XY, Zhao CQ., Li H., Sun XJ, You-Zhuan X., Ding W., Zhao J. (2013), *Hypertrophy and Fibrosis of the Ligamentum Flava in Lumbar Spinal Stenosis is Associated with increased Expression of LPA and LPAR1*. J Spinal Disord Tech. 11(15) s. 511-519.

Submitted: 05.05.2014

Accepted: 09.06.2014

PLACE AND ROLE OF PHYSICAL ACTIVITY IN THE LIVES OF THE ELDERLY AND DISABLED PEOPLE

Barbara Bergier

Pope John Paul II State School of Higher Education

Bergier B. (2014), *Place and role of physical activity in the lives of the elderly and disabled people*. Health Problems of Civilization 2 (8), p. 10-14

Summary: The role of physical activity in the healthy lifestyle is a recurring element of surveys at every stage of the human life. The fact that people live longer indicates a necessity for studying the issue of physical activity of the elderly and disabled people. This review of researches reveals issues concerning physical activity of the elderly in Poland, and in other countries. Moreover, the study relates to the problem of physical activity among the elderly with disabilities. Researches show that this subject matter is present in the domestic studies relatively rarely. Results of surveys from other countries also concern issues of the elderly at around 80 years of age. The authors indicate the significant role of physical activity among the elderly, and the accompanying barriers.

Key words: physical activity, the elderly, disabled people

Introduction

The extension of human life in Poland and in other countries is connected to the issue of people's disability, which generates new social, and economic challenges. According to the research of Zatoński et al. (2011), the life expectancy of people born in Europe in 2002 will be the highest in case of men in Sweden – the age of 77.7, whereas the average life expectancy in Poland will be 70.3. The forecasted women's life is to be the highest in Spain – the age of 82.2, and in Italy – 83.1, whereas the average life expectancy for women in Poland is 78.8. It should be pointed out that the predicted life expectancy for Poles places us among the new European Union member states. For instance, in Latvia the men life expectancy reaches 64.7, and women in Romania – 74.7, whereas the lowest European rates are in Russia: the age of men – 58.9 and women – 71.9.

The world leaders of the issue of physical activity (Blair et al.) indicate its significant health-improving function of at every stage of human life.

The contemporary researchers (Bouchard et al. 2007) point out that the limiting of physical activity by the elderly causes among others: metabolic dysfunctions, decline of physical endurance, and increase in the number of cardiovascular diseases.

The latest studies of other countries provide results of researches concerning physical activity among the disabled elderly (Burns 2009, Freeman, Selmi 2010, Gray et al. 2012, Kerr et al. 2012, Sirkka et al. 2012). The current studies of physical activity among the disabled elderly in Poland are relatively rare.

The publishing of Osiński's book (2013) in our country is worth emphasizing, because it discusses the subject of physical activity among the elderly.

Physical activity of adults in Poland

The first studies of physical activity of adults in Poland on a large population were carried out by Drygas et al. (2005). They demonstrated that 37% of women and 32% of men do not perform any exercises lasting min. 30 minutes daily in their free time. A percentage of people performing the given satisfactory amount of exercises during most weekdays is 38% of men and 34% of women. It should be noted that there are wide vari-

Address for correspondence: Barbara Bergier, Pope John Paul II State School of Higher Education, Sidorska 95/97, Biała Podlaska
e-mail: barbara.bergier@wp.pl, phone +48 (83) 344 99 02

Tables: 0, **Figures:** 0, **References:** 49, **Full text PDF** www.hpc.edu.pl **Copyright** © Pope John Paul II State School of Higher Education In Biała Podlaska, Sidorska 95/97, 21-500 Biała Podlaska **Indexation:** Index Copernicus, Polish Ministry of Science and Higher Education. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-commercial License (<http://creativecommons.org/licenses/by-nc/3.0>), which permits use, distribution, and reproduction in any medium, provided the original work is properly cited, the use is non-commercial and is otherwise in compliance with the license.

ations in separate Voivodeships of our country. Most people perform satisfactory physical activity in Lubelskie and Opolskie Voivodeships regarding both men, and women – respectively 51% and 47%, and 50% and 46%. The lowest percentage of performing recommended activity was observed among men in Podlaskie – 26%, and Śląskie – 32%, and among women in Pomorskie – 25% and Śląskie – 25%.

In the summary, the author (Drygas et al. 2005) points out that physical activity of the Polish society studied in 2000-2004 was higher than in the 90. of the previous century.

Unfortunately, physical activity becomes lower with age, especially after taking up a job. According to researches of the Polish Central Statistical Office (GUS), the number of people doing exercises systematically (minimum once a week) aged 20-24 makes circa 32%, aged 45-49 – 13%, and in the oldest groups considerably lower – aged 65-70 – 9%, aged 75 and older – only 4%. The surveys of the Polish Central Statistical Office (GUS) show that 14.2% of people did exercises once a week, 10.6% - twice, 6.2% - three times, 4.8% - four, or five times, and 5.7% - six or more times a week. It is worth noticing that the results are less favourable when compared to results from 2000.

The first nationwide study in which the international standard questionnaire (IPAQ – short version) was used was presented by Piątkowska (2010). It enabled the comparative analysis of Poland and other countries. As a result of these surveys it was stated that physical activity of Poles and Europeans is at the similar level. However, Poles do not perform recreational activities, but compensate for it in another fields of general activity.

The current studies concerning physical activity of the elderly show many positive sides of the proper role of physical activity in their lives. The survey of physical activity of women aged 55-75 in Poland (Knapik et al. 2011) reveal the relationship between the level of physical activity and physical and mental health of women, and the decrease in physical activity and self-esteem over the age of 60.

Surveys of Gabryelewicz and Mandecka (2013) point out that the regular physical activity of the elderly may contribute to the prevention of cognitive disorders and slow down the progress of Alzheimer. On the other hand, Bujanowska-Fedak et al. (2013) performed a complex geriatric evaluation of people over 60 in the Lower Silesia with reference to the effectiveness of walking, balance, and coordination. Good results were reported for walking –with worse results of women, and problems with coordination, balance and walking in the group of people aged 75 and more.

Surveys of Drobnik et al. (2010) show that performing physical activity in youth influences its maintaining at the following stages of live, as well as at the old age.

Survey of physical activity of the elderly in other countries

Surveys of foreign authors to a large extent concern physical activity of the oldest individuals. The American studies (Church et al. 2013) show that an active lifestyle influences positively the functioning of people aged between 70 and 89.

Results of survey of the same group of people (Chale-Rush et al. 2010) point out that factors such as gender, BMI, signs of depression, age, and amount of medicines should be taken into consideration in order to prevent disability.

Studies of Patel et al. (2006) in Italy of a group of people of average 75 years of age indicate that people who were more physically active in their middle age, were more mobile in the old age.

The survey of physical activity of disabled people in Poland is one of the most important scientific problems studied by the employees of the State Higher School in Biała Podlaska. The university realized two central projects of the State Fund of People with Disabilities.

As a result of the project “Social conditioning of the disabled people’s participation in tourism and recreation in the Eastern Poland”, many publications were published (Bergier J. et al. 2007, 2011, Bergier B. et al. 2007, 2010, 2013, Kubińska et al. 2013).

The second project “Determinants of professional activity of disabled people residing countryside” was co-financed by the State Fund for Rehabilitation of People with Disabilities (PFRON) resulted in the preparation of 4 volumes of monographs (Żbikowski et al. 2012).

The project of the Voivodeship Employment Office titled “Determinants of professional activity of disabled people residing countryside in the Lubelskie Voivodeship” was financed by the European Social Fund in terms of the Human Capital Operational Programme. Three studies were published (Bergier J., Tomczyszyn 2011, Bergier J. et al 2012, 2013).

One of the most difficult scientific problems, which is the evaluation and analysis of the physical ability of the elderly with disabilities, has gained the attention of researchers recently.

Burns et al. (2009) indicated the numerous barriers appearing in the countryside with using recreational activities. Freeman and Selmi (2010), who carried out surveys in Canada and France, recommend increasing touristic opportunities for disabled people. Gray et al. (2012) created a review of infrastructure for physical activity and proposed facilities to be introduced. Sirkka et al. (2012), Kerr et al. (2012) also pointed out the necessity to introduce new technologies in the active rehabilitation and recreation of the elderly. Researches carried out recently on physical activity of the elderly with disabilities prove the social specificity of the problem.

Conclusions

The extension of human life brings new challenges to physical activity, which is extremely important factor in their lifestyle. It is worth noticing on the example of Poland that the predicted lifetime of people born at the beginning of this century will reach the age of 70 (Zatoński et al. 2011).

The first researches on physical activity in our country on a large population brought unfavourable results, worse for women than for men (Drygas et al. 2005). Even though authors pay attention to the fact that physical activity in 2000-2009 is higher than at the end of the previous century, they point out that most adult Poles do not fulfil requirements recommended by experts.

It is also emphasised that physical activity is decreasing along with taking up a job, and falls systematically, especially at the age of 65-74, and the most after 75 year of age (GUS 2009).

In order to trace changes in physical activity it is necessary to use the same, or similar evaluating tool.

Researches of Piątkowska (2010) with the use of the International Physical Activity Questionnaire (IPAQ) allowed for comparison with other countries, and showed that physical activity of Poles is similar to that of other Europeans. However, the Polish citizens are characterised with a lower recreational activity, at the expense of a bigger share of domestic activities. Surveys of physical activity of citizen of 6 European countries, including Poland (Drygas et al. 2001), indicated a very low recreational activity of Poles. This problem is reinforced by the biggest rates in the sedentary lifestyle for Poland.

Studies on physical activity of the elderly in Poland are relatively limited (Knapik et al. 2011, Gabrylewicz and Mondrecka, 2013; Bujanowska-Fedak et al. 2013; Drobnik et al. 2010) and relate mainly to people at the age of 60. They indicate relationship between physical activity and a healthy lifestyle. They indicate a relation between the level of physical activity and a healthy lifestyle.

Research conducted by foreign authors concerning in a larger extent the oldest persons, that is at the age over 70 years old (Patel et al. 2006, Chale-Rush 2010, Church et al. 2013). Also this research indicates a beneficial impact of physical activity on the functioning of persons in the oldest age group.

Studies of physical activity of older people with the use of the same tool (IPAQ) in Poland are of contributory nature (Knapik et al. 2011, Biernat 2011, Pańczyk 2010), therefore, it is difficult to assess the physical condition of this age group of Poles. So far conducted studies on physical activity of older people have all shown a beneficial effect on the quality of life of older people (Osiński 2002, 2013, Borowiak, Kostka 2003, Nowak 2009, Kübler, Wójcik- Grzyb 2010, Rowiński, Dąbrowski 2011). It can therefore be assumed that the possible systematic physical activity of older people affects the improvement of their functional efficiency and eases the process of aging. Modern researchers (Bouchard et al. 2007) also show that the restriction of physical activity among the elderly causes, among others, deterioration in metabolic function, loss of function and increased occurrence of cardiovascular diseases.

Authors dealing with the physical activity of people with disabilities conduct new exploration research in terms of their participation in the tourism and recreational activity (Kubińska et al. 2011, Bergier B. et al. 2010, 2013). The results of these studies indicate that people with disabilities who have a lot of free time, were involved in tourist trips and physical activities to a small extent. Their main tourist trips concerned rehabilitation, bus trips and stays in the sanatorium. Among their modest physical activity they tend to prefer walking and gymnastics. As some of the obstacles of their participation in physical activities they indicate the high cost of fees related to such activities. You could say that the recommended physical activity for people with disabilities in Polish conditions is still very difficult to be implemented.

References:

1. Bergier B., Bergier J., Grudniewski T. (2007), *Free time of the disabled from eastern provinces of Poland*. Annales Universitatis Mariae Curie-Skłodowska. Sectio D. Medicina. Vol. 62, suppl. 18, nr 1, s. 196-200
2. Bergier B., Bergier J., Kubińska Z. (2010), *Environmental determinants of participation in tourism and recreation of people with varying degrees of disability*. Journal of Toxicology and Environmental Health, Part A Vol. 73, iss. 17-18, s. 1134-1140

3. Bergier B., Kubińska Z., Bergier J. (2013), *Interests and needs for participation in tourism among disabled from eastern regions of Poland*. Annals of Agricultural and Environmental Medicine, vol. 20, No. 4, s. 807-811
4. Bergier J., Dąbrowski D., Żbikowski J. (2011), *Conditioning of participation of disabled males and females from eastern regions of Poland in tourism and recreation*, Annals of Agricultural and Environmental Medicine, Vol. 18 (2), s. 350-354
5. Bergier J., Tomczyszyn D. (2011), *Determinanty aktywności zawodowej osób niepełnosprawnych zamieszkałych na obszarach wiejskich w województwie lubelskim: raport z badań*. Koordynator projektu J. Bergier; koordynator merytoryczny D. Tomczyszyn. Państwowa Szkoła Wyższa Biała Podlaska.
6. Bergier J., Tomczyszyn D., Romanowicz W. (2012), *Wykorzystanie czasu wolnego osób niepełnosprawnych z obszarów wiejskich województwa lubelskiego*. Zamojskie Studia i Materiały. Seria Fizjoterapia, R. 14, z. 1, s. 147-156
7. Bergier J., Tomczyszyn D., Romanowicz W. (2013), *Aktywizacja zawodowa kobiet niepełnosprawnych z obszarów wiejskich woj. lubelskiego: Niepełnosprawność i Rehabilitacja*, R. 13, nr 2, s. 24-36
8. Bergier J., Żbikowski J., Stelmach M. (2007), *Salubrious Values of Sport and Recreational Activities in the Option of Disable Inhabitants of Rural Areas of the Lublin Province*. Polish Journal of Environmental Studies Vol.16, no. 5c, Part 2, s. 769-772
9. Biddle S. (1995), *Exercise and psychosocial health*. Res. Quart. Exerc. Sport, 66, 292-297
10. Biernat E. (2011), *Aktywność fizyczna mieszkańców Warszawy. Na przykładzie wybranych grup zawodowych*. Oficyna Wydawnicza. Szkoła Główna Handlowa w Warszawie.
11. Blair S.N., Kohl H.W., Girdon N.F., Paffenbarger R.S., Jr (1992), *How much physical activity is good for health?* Annual Rev. Pub. Hlth. 13, 99-126
12. Booth M.L., (2000), *Assessment of Physical Activity: An International Perspective*. Res. Quart. Exerc. Sport 71, 114-120
13. Borowiak E., Kostka T. (2003), *Aktywność ruchowa starszych mieszkańców Łodzi*. Medycyna Sportowa, nr 4. s. 139-146
14. Bouchard C., Blair S.N., Haskell W.L. (ed.) (2007), *Physical Activity and Health*, Human Kinetics, Champaign
15. Bouchard C., Depres J.P. (1995), *Physical activity and health. Atherosclerotic, metabolic and hypertensive diseases*. Res. Quart. Exerc. Sport 66, 268-275
16. Bujanowska-Fedak M.M., Kumięga P., Sapilak B.J. (2013). *Assessment of functional capacity of elderly persons in family practice based on selected scale tests*. Family Medicine and Primary Care Review. Vol. 15, Iss 2, 76-79
17. Burns N., Paterson K., Watson N. (2009), *An inclusive outdoors? Disabled people's experiences of countryside leisure services*. Source: Leisure Studies Vol. 28. Iss. 4. Pages: 403-17. DOI: 10.1080/02614360903071704. Published
18. Chale – Rush A., Guralnik I.M., Walkup M.P., Miller M.E., et.al (2010), *Relationship between physical functioning and physical activity in the lifestyle interventions and independence for elders pilot*. Journal of the American Geriatrics Society. Vol. 58, Iss. 10, 1918-1924
19. Church T., Maeshall S.A., Zhang Q et. al. (2013), *Physical activity increases gains in and prevents loss of physical function: Results from the lifestyle interventions and independence for elders pilot study*. Journals of Gerontology – Series A Biological Sciences and Medical Sciences. Vol. 66, Iss. 4, 426-432.
20. Craig C.L., Marschall A.L., Sjöström M., Bauman A.E., Booth M.L., Ainsworth B.E., Pratt M., Elund U., Yngve A., Sallis J.F., Oja P. (2003), *International Physical Activity Questionnaire:12- Country Reliability and Validity*. Med. Sci. Sport Exerc. 35, 1381-1395.
21. Drobnik J., Malcewicz M., Józefowski P., Kurpas D., Susło R., Steciwko A. (2010), *Effects of physical definity in early adulthood on formation of positive old age – pilot survey*. Family Medicine and Primary Care Review. Vol. 12, Iss. 3, 643-647.
22. Drygas W., Kwasniewska M., Szcześniewska D., Kozakiewicz K., Głusek J., Wiercińska E., Wykrzykowski B., Kurjata P. (2005), *Ocena poziomu aktywności fizycznej dorosłej populacji Polski. Wyniki programu WOBASZ*. Kardiologia Polska, 63:6 (supl.4) s. 1-5.
23. Drygas W., Skiba A., Bielecki W., Puska P. (2001), *Ocena aktywności fizycznej mieszkańców sześciu krajów europejskich*. Medicina Sportiva 5, Supl. 2, 119-128
24. Freeman I., Selmi N. (2010), *French versus Canadian Tourism: Response to the Disabled*. Journal of Travel Research. Vol.: 49, Iss. 4, Pages 471-85, DOI: 10. 1177/0047287509349268. Published: NOV
25. Gabrylewicz T., Mandacka M. (2013), *Effects of physical activity on cognitive functions in older adults and the course of alzheimer's disease*. Aktualności Neurologiczne, Vol. 13, Iss. 1, 56-61
26. Gray J.A., Zimmerman IL., Rimmer IH. (2012), *Built environments for walkability, bikeability, and recreation: disability and universal design relevant?* Disabil Health J; Apr; 5(2): 87-101

27. Ip E.H., Church T., Marshall S.A., Zhang Q, et.al (2013), *Physical activity increases gains in and prevents loss of physical function: Results from the lifestyle interventions and independence for elders pilot study*. Sciences and medical Sciences. Vol. 66, Iss. 4, 426-432
28. Kerr IL., Dattilo I., O'Sullivan D.(2012), *Use of recreation activities as positive coping with chronic stress and mental health outcomes associated with unemployment of people with disabilities*. Work:43(3): 279-92.
29. Knapik A., Rottermund J., Myśliwiec A., Plinta R., Gruca M. (2011), *Aktywność fizyczna a samoocena zdrowia osób w starszym wieku*. Przegląd Medyczny Uniwersytetu Rzeszowskiego i Narodowego Instytutu Leków w Warszawie, Nr.2, 195-204.
30. Knapik A., Saulicz E., Plinta R., Kuszewski M. (2011), *Aktywność fizyczna a zdrowie kobiet w starszym wieku*. Journal of Orthopaedic Trauma Surgery and Related Research.. Iss. 26, 27-33.
31. Kubińska Z., Bergier B., Bergier J. (2011), *Uczestnictwo w turystyce i rekreacji ruchowej osób niepełnosprawnych zamieszkałych w miastach i wsiach województwa lubelskiego*. Medycyna Ogólna i Nauki o Zdrowiu, Tom 17, Nr. 4, s. 189-193
32. Kubińska Z., Bergier B., Bergier J. (2013), *Usage of leisure time by disabled males and females from the Lublin Region*. Annals of Agricultural and Environmental Medicine. 2013, Vol. 20, No 2, s. 341-345.
33. Kübler M., Wójcik – Grzyb A. (2010), *Motywy i korzyści podejmowania aktywności fizycznej w ocenie kobiet w średnim i starszym wieku*. Medycyna Sportowa, t. 26, nr 5 s. 253-259
34. Lee I.M. (1995), *Exercise and physical health*. Cancer and immune function. Res. Quart. Exerc. Sport 66, 286-281
35. Nowak M.(2009), *Wpływ aktywności fizycznej na prawidłową masę ciała kobiet po 60 roku życia*. Aktywność ruchowa kobiet. Formy, uwarunkowania, korzyści i zagrożenia. AWF Warszawa
36. Osiński W. (2002), *Aktywność fizyczna podejmowana przez osoby w podeszłym wieku*. W: Antropomotoryka red. E. Mleczko. AWF Kraków.
37. Osiński W. (2013), *Gerokinezylogia. Nauka i praktyka aktywności fizycznej w wieku starszym*. Wydawnictwo Lekarskie. PZWL
38. Pańczyk W. (2010), *Aktywność fizyczna mieszkańców południowo-wschodnich regionów Polski u progu XXI wieku*. W: Społeczno-edukacyjne oblicza współczesnego sportu i olimpizmu. Aktywność fizyczna dzieci, młodzieży i dorosłych na przełomie XX i XXI wieku. red. J. Nowocień, J. Chełmecki. AWF Warszawa. Polska Akademia Olimpijska. Fundacja „Centrum Edukacji Olimpijskiej”. Warszawa
39. Patel K.V., Coppin A.K., Manini T.M., Lauretani F., et.al (2006), *Midlife Physical Activity and Mobility in Older Age*. The InChianti Study. American Journal of Preventive Medicine. Vol. 31, Iss. 3, 217-224.
40. Piątkowska M. (2010), *Uczestnictwo Polaków w aktywności fizycznej w porównaniu do innych krajów Unii Europejskiej*. W: Współczesne metody badań aktywności, sprawności i wydolności fizycznej człowieka. red. K. Buśko, J. Charzewska, K. Kaczanowski. AWF Warszawa
41. Romanowicz W., Bergier J., Tomczyszyn D. (2013), *Age as a Differential Factor of the Activity of Disabled People in the Rural Areas of the Lubelskie Voivodship*. Barometr Regionalny, T. 11, nr 1, s. 71-79
42. Rowiński R., Dąbrowski A. (2011), *Wpływ regularnej aktywności ruchowej na sprawność fizyczną i jakość życia seniora*. Turystyka i Rekreacja, nr 7, s. 109-114
43. Sirkka A., Merilampi S., Koivisto A., Leinonen M., Leino M. (2012), *User experience of mobile controlled games for activation, rehabilitation and recreation of elderly physically impaired*. Stud Health Technol Inform; 177; 289-95
44. Tomczyszyn D., Bergier J., Szczygielska E., Matusiak P. (2012), *Aktywność zawodowa osób z niepełnosprawnością w opiniach osób niepełnosprawnych pochodzących z terenów wiejskich województwa lubelskiego i pracodawców : prezentacja wyników badań*. W: Aktywność zawodowa osób z niepełnosprawnością. Wydawnictwo PSW im. Papieża Jana Pawła II w Białej Podlaskiej, s. 11-51
45. Uczestnictwo Polaków w sporcie i rekreacji ruchowej. GUS, Warszawa 2009
46. Uczestnictwo Polaków w sporcie i rekreacji ruchowej (w okresie 1.X 1998- 30.IX.1999r.)
47. Vuori I. (1995), *Exercise and physical health*. Musculoskeletal health and functional capabilities. Res. Quart. Exerc. Sport 66, 276-285
48. Zatoński W.W. i wsp. (2011), *Wyrównywanie różnic w zdrowiu między krajami Unii Europejskiej*. Centrum Onkologii- Instytut Marii Skłodowskiej-Curie. Warszawa
49. Żbikowski J., Dąbrowski D., Kuźmicki M. (2012), *Determinanty aktywności zawodowej osób niepełnosprawnych zamieszkałych na obszarach wiejskich*. Raport z badań. Państwowa Szkoła Wyższa w Białej Podlaskiej

Submitted: 26.05.2014

Accepted: 16.06.2014

PHYSICAL ACTIVITY OF ELDERLY PEOPLE ON THE EXAMPLE OF THE COURSE PARTICIPANTS AT THE UNIVERSITY OF THE THIRD AGE IN KROSNO

Dariusz Jurczak, Adam Przybysz

State Higher Vocational School in Krosno

Jurczak D., Przybysz A. (2014) *Physical activity of elderly people on the example of the course participants at the University of the Third Age in Krosno*. Health Problems of Civilization 2 (8), p. 20-27

Summary: Regular physical activity plays a very important role at every stage of human life. Its comprehensive impact also in terms of health can not be overestimated. Unfortunately, despite many activities for the promotion of physical culture, as reported by several studies and publications, still as a society we are not very physically active. The aim of the study was to answer the questions regarding the assessment of physical activity of older course participants at Krosno University of the Third Age. The research was conducted in October 2012. It was attended by 74 people. The main research method was a diagnostic survey and questionnaire. Based on the obtained results it can be concluded that the University provides its listeners access to a wide range of different kinds of physical activity, as evidenced by the fact that over 80% of them avail of these offers. Over 40% of respondents note that the time they spend on physical activity does not exceed two hours per week. On the other hand, 15% do so more than five hours per week. The most popular forms of physical activity among the respondents include classes in the pool, gym and rallies tours, hiking, biking and Nordic walking. The main impetus motivating older people to engage in physical activity is the need to move, care and attention to their own health.

Key words: physical activity and exercise, health, elderly person, university of the third century

Introduction

*Nothing ruins a man as much as
his continuous stillness*
Aristotle

Words expressed over two thousand years ago by the Greek philosopher are very valid even in today's times. The unsatisfactory state of physical activity among the population (this problem is already visible among the youngest children) is one of the main factors because of which people often suffer from diseases of civilization of the cardiovascular system (heart attacks and strokes, hypertension), coronary heart disease, atherosclerosis, diabetes, cancer, hypertension, obesity (Drabik 1995). Of course, the causes of these diseases have different substrate including genetic, but certainly also one of the main sources is insufficient or total lack of movement (Jethon, Wierzbicka-Women 2005). During the revival time Wojciech Oczko, a prominent humanist, court physician of King Stefan Batory in his work on *O różnych przypadłościach „ciała ludzkiego”* (1581) stressed the importance of diet and health advantages of physical exercise, which he recognized not only as a prophylactic measure, but also as the clinical treatment. He wrote then: „*Physical activity is able to replace all the drugs put together, but all drugs are no substitute of an activity*” a phrase that continues to be of meaningful significance (Gaj, Hądzelek 1997). In the times in which we live, when quite frequently many people have no contact with physical activity - the reasons for this have multiple sources, among which the progress of civilization ought to be mentioned (the development of technology, computerization, communication) as well as convenient and consumptive attitude to life, excess of professional duties including overload of work or study (Woynarowska 2010). As never before, physical activity should be promoted as it is a moderate and regular exercise which can be an antidote to these diseases (Kopczyńska-Sikorska 1981, Bielski, 1997). The movement creates an opportunity for this to alleviate or remove many path-

Address for correspondence: Adam Przybysz, State Higher Vocational School in Krosno, Rynek 1, 38-400 Krosno, e-mail: adamkrosno@onet.pl, phone +48 (13) 437 55 00

Tables: 0, **Figures:** 9, **References:** 18, **Full text PDF** www.hpc.edu.pl **Copyright** © Pope John Paul II State School of Higher Education In Biała Podlaska, Sidorska 95/97, 21-500 Biała Podlaska **Indexation:** Index Copernicus, Polish Ministry of Science and Higher Education. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-commercial License (<http://creativecommons.org/licenses/by-nc/3.0>), which permits use, distribution, and reproduction in any medium, provided the original work is properly cited, the use is non-commercial and is otherwise in compliance with the license.

ogens (Drabik J., Drabik P. 1997 Woźny 2013). A special request should be addressed to the parents, because they should be aware that the development of disorders and diseases, which are triggered by contemporary life, takes place slowly (they may even remain in a latent state for a long time) and therefore they are not immediately seen in children, and their dynamics is usually disclosed in the period of maturity (Woynarowska 2001). Unfortunately, nowadays we very often hear that because of the excessive duties we do not have time for sport, physical activity, walking, ridding a bicycle, recreation and tourism (Rochowicz 2008). These words are not just said by the adults, but also very often by the youngest of us. It seems that the problem is not the actual lack of time, but it exists in other obstacles, such as the psyche. People do not feel the need for physical activity, the need to spend time outdoors. This need should stem from the internal motivation, from the awareness and deliberate desire to do something for health (Demel 1980 Cendrowski 1997), as it often happens that a young man completes two specializations, has a lot of knowledge, but the state of his health (at the age of twenty-several years old) qualifies him for benefits, or sickness pensions (Pańczyk, Warchoł 2011).

The aim of this study was to answer the questions regarding the assessment of physical activity of older course participants of the Krosno University of the Third Age. Based on numerous published literature, reports, conferences and symposia, discussions on the state of health of the Polish population, it is clear that physical activity among the population is not very satisfactory (Cendrowski 1997, Cynarski, Bajorek 2009, Osinski 2011). For many years, studies have shown that very few, because just over 10% of the adult population has a purposeful, conscious and systematic contact with the physical activity (Bergier 2012).

Materials, methods and research results

The study was conducted in October 2012 among course participants of Krosno University of the Third Age (further called KUTW). The research method was a diagnostic survey and questionnaire (Palka 2010). The research included 74 people (including 62 women and 12 men) who responded to the questionnaire survey. A set of questions with both open and closed questions related mainly to the attitude of participants to physical activity.

As it is visible on Figure 1 KUTW course participants in the vast majority have a positive attitude toward physical activity. This may prove that the importance of physical activity among older people plays a significant role.

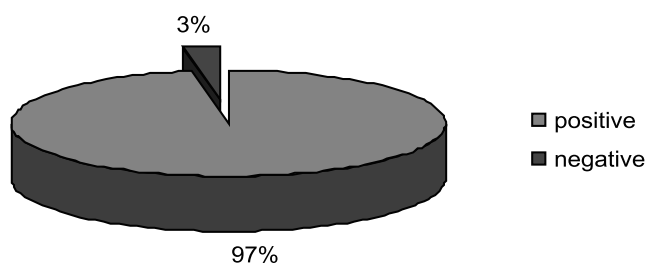


Figure 1. Relationship towards physical activity (N=74)

Among all respondents, 45% of respondents indicated professional activity. Research shows that the responsibilities associated with work do not constitute a substantial obstacle to the cultivation of physical activity. Nearly half of the surveyed students of KUTW are people who are still active professionally. In this situation, it is clear that what determines whether the weekly timetable will include physical activity is the need and desire to practice any form of movement to a greatest extent, which undoubtedly is also affected by awareness of the importance of movement in human life.

The fact that 96% of respondents in their replies declared that they are physically active should be seen as very positive outcome - including 39% expressing it in a decisive manner. Only 4% of respondents indicated a lack of physical activity in their lives.

The primary impetus for the elderly is the need for physical activity movement. Care for one's own health plays a very important role in the implementation of the elderly to leisure activities. It is worth noting that the response in this regard corresponds with what has been said before, that the need for exercise and care for one's health are the main factors motivating the respondents to attend sports facilities. Percentage of different stimuli of older people in physical activity has been presented in Figure 2.

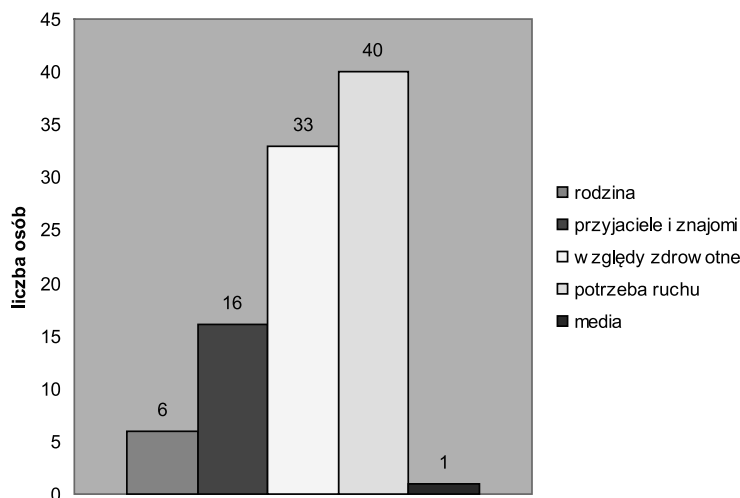


Figure 2. Factors stimulating physical activity among course participants (N=74)

As it is obvious from the answers to the question as to how the students mostly spend their free time, the most popular form of activity is work in the garden (31 replies). Walking is also very popular (30 responses). In addition, participants are very happy to meet up with friends and colleagues, and spend their free time reading books (23 responses). Undoubtedly, the reason that a lot of them are fond of reading may be due to the fact that almost half of the students are people with university education.

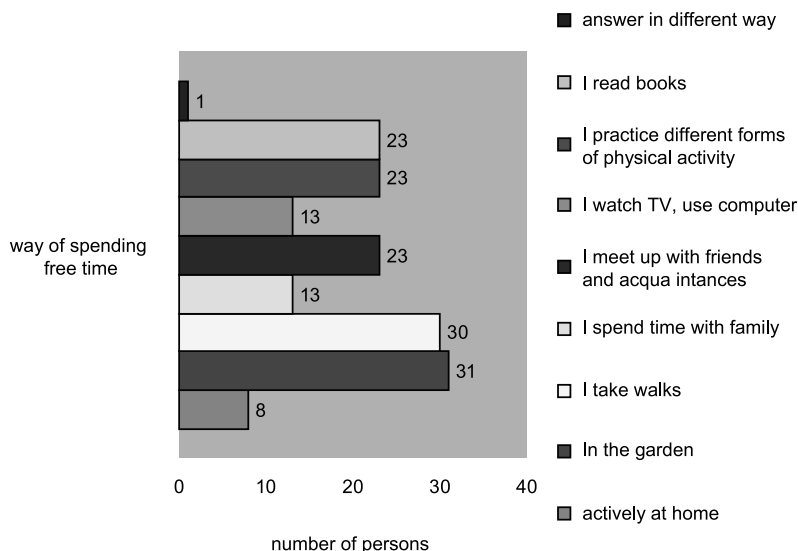


Figure 3. Ways of sending free time among participants (N=74)

On the other hand, Figure 4. presents forms of physical activity that students prefer. As it is clear from the below answers the most common form of activity is hiking (54 responses) and cycling (38 responses); 22 people opted for Nordic walking. The least interest among the respondents are the team games, while football was mentioned only by 3 people. 1 person mentioned basketball. Lack of interest in these disciplines can probably be explained by the fact that the vast majority of the respondents were women (84%). Besides that, 4 persons declared that they cultivate other activities, which include: gymnastics, aerobics and dance. It is worth noting that only one person indicated not performing any form of activity.

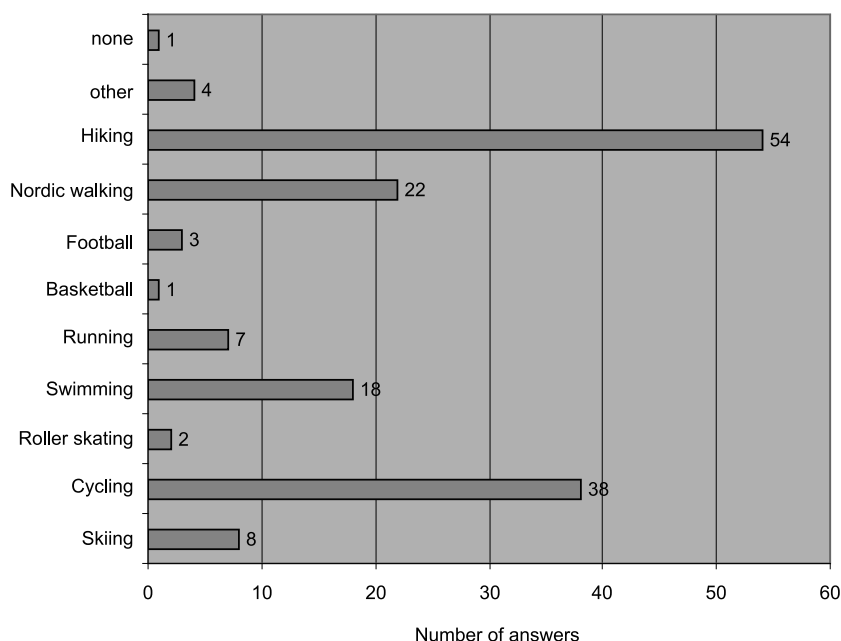


Figure 4. Forms of physical activity preferred by the participants (N=74)

Elderly people wanting to practice physical activity often face different barriers and obstacles, which to some extent certainly limit the possibility of spending free time. It is clear from the study (Figure 5), that the biggest difficulty for the elderly in the systematic cultivation of physical activity is the lack of perseverance and consistency (22%) and an excess of household duties and family obligations (16%). Another barrier is reluctance to exercise (15%). The respondents indicated poor health condition on the fourth place (13%). Only 9% of respondents as a barrier to practicing physical activity considered insufficient funds. The fact that only a small number of respondents drew attention to the financial aspect undoubtedly stems from the fact that KUTW to a large extent provides its students with possibility of physical activation in an organized manner at a symbolic cost. These classes are enjoying great interest of the students.

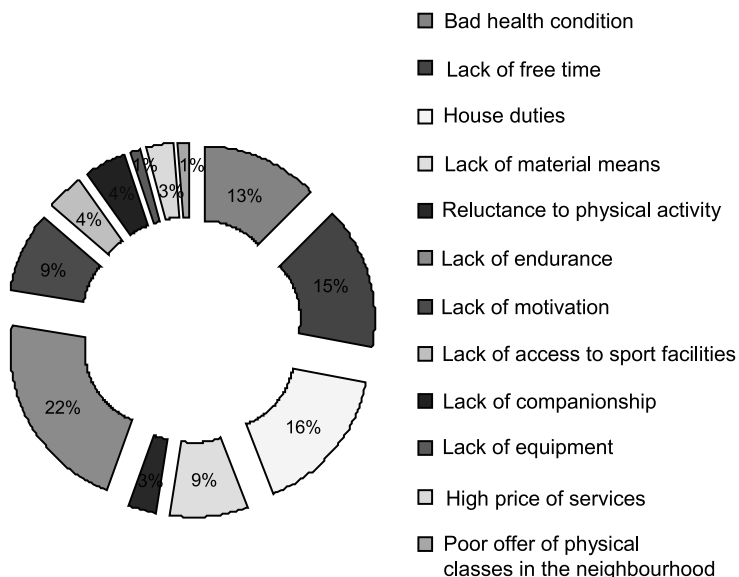


Figure 5. Barriers limiting physical activity among recipients (N=74)

As per the obtained results, a lot, as much as 41% of the surveyed persons stated that the amount of time per week they spend on physical activity does not exceed 2 hours. In this situation, it is worth noting that this is the exact amount of time that classes in gymnastics or swimming pool classes take. Hence, it should be noted that for this large group, the activities organized by KUTW become the only opportunity to practice sports. The fact that 34% of respondents practice sports up to 5 hours per week, while 25% of respondents do it more than 5 hours a week is comforting.

Krosno University of the Third Age makes efforts in order to activate its members to physical activity by organizing for them a number of physical activities. The most popular forms include hiking and biking tours, which in the summer are organized periodically (at least once a month). In the winter months they are joined also by sleigh ridding. Particular participation of the students in organized activities is illustrated in Fig. 6

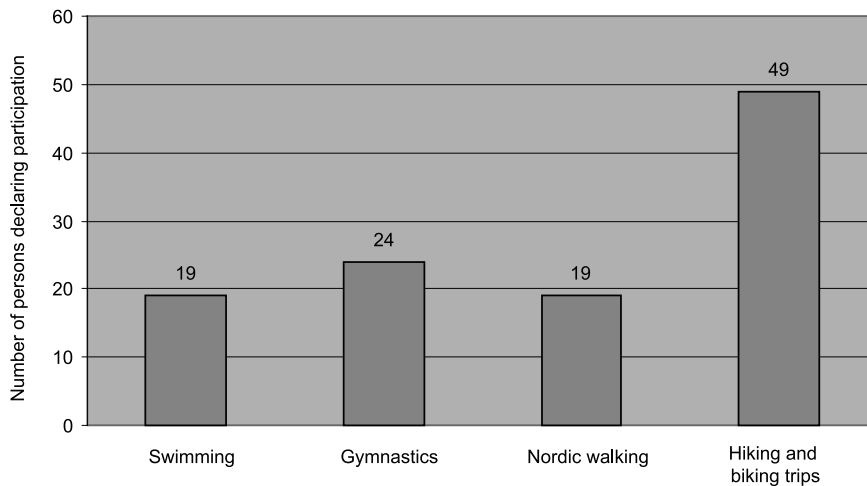


Figure 6. Forms of physical activity preferred by students (N=74)

A positive aspect that should be considered is that 81% of course participants systematically and regularly attend courses of their choice. This condition is also confirmed by leading teachers who assess attendance and systematic participation at a satisfactory level. The fact that as many as 62% of respondents declared participation in various forms of physical activity outside the University is satisfactory.

Figure 7 illustrates all forms of physical activity undertaken by the respondents outside of the classroom at the University. A detailed description is presented in Table 1

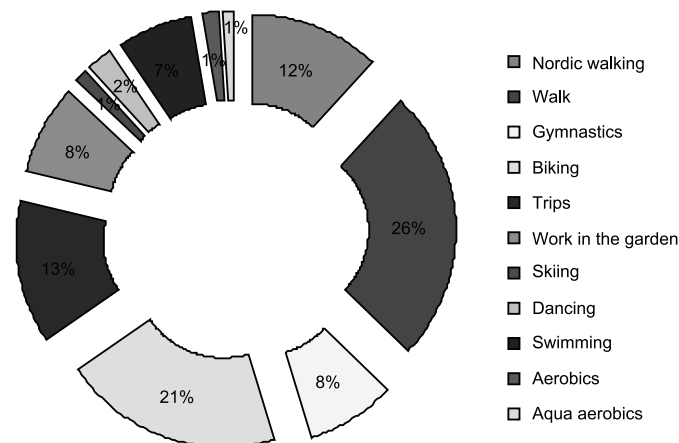


Figure 7. Forms of physical activity taken up by course participants of KUTZ (N=74)

Table 1. Participation of students in forms of physical activity outsider KUTW (N=74).

Conducted themselves		Organized	
Form of activity	N	Form of activity	N
walk	18	trips	9
Bike ride	16	Swimming pool	5
Walking and cycling tours	9	nornic walking	4
gymnastics	6	gymnastics	1
nordic walking	6	aerobics	1
gardeining	6		

Swimming pool	5		
Skiing	1		
Dancing	1		
aerobics	1		
TOTAL	69		20

As is clear from the data presented in Figure 7. and Table 1, out of the 44 people who have declared participation in additional forms of activity it was indicated 69 times that participants organize their own free time. The most popular form of activity in this scope is a walk (18 responses) and cycling (16 replies). While the least popular disciplines are: skiing, dancing and aerobics (1 reply each). On the other hand, among the organized forms trips are the most popular (9 responses), and the least popular activities are gymnastics and aerobics (1 reply each). It should be noted that in this regard the question had an open form, respondents could give multiple answers that were not imposed on them (above types of disciplines were given by the respondents by themselves).

The data in Table 2 show how often a week the course participants exercise physical activity outside of KUTW. Out of 42 people who declared that they are active outside the discussed institution, 12 people noted that they perform it five times a week, while 18 people noted they perform it one or two times a week.

Table 2. Frequency of participating by the respondents in forms of physical activity outsider KUTW (N-74)

NUMBER OF CLASSES PER WEEK	N
once	9
twice	9
3 times	5
4 times	5
5 times	12
More than 5 times a week	4
TOTAL	44

Sources of motivation for practicing physical activity were presented in Figure 8. The most common reason for participation in physical activity among the respondents is the care about their own performance and physical condition (28%). The desire to improve health status was of very high importance here (21%), just as having a good leisure time (19%).

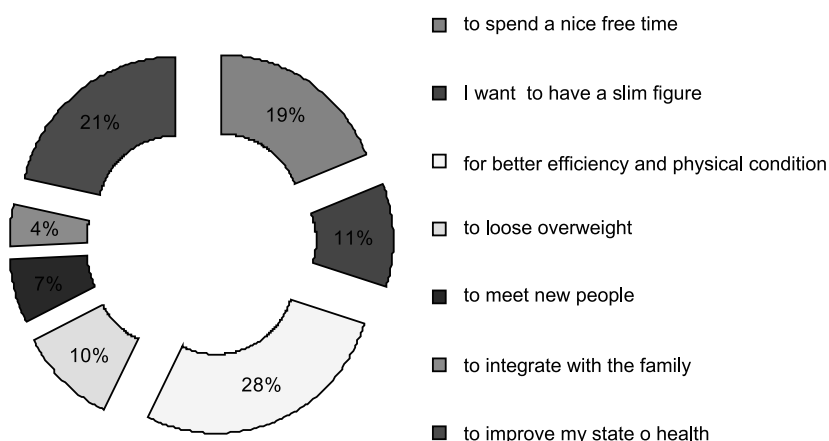


Figure 8. Reasons for performing physical activity among participants (N=74)

The fact that 97% of respondents are satisfied with the state of their physical fitness (including 55% of respondents indicating that they were satisfied, while 44% noting they were rather satisfied) is optimistic. This desirable situation must undoubtedly be combined with a generally increasing promotion and popularity of physical activity among the society with a broader than in the past access to recreation, and, as indicated in the above studies, greater than ever consciousness of the elderly regarding the need for active leisure, among others, through physical activity.

In addition, among the positive factors that have an impact on physical efficiency of the respondents one should consider lack of too frequent hanging out time in front of computer and television - the data is presented in Figure 9. As can be seen, the number of hours spent a day sitting in front of the TV and the computer is small. Hence, students can devote this time (for the benefit of their health and well-being) to active rest.

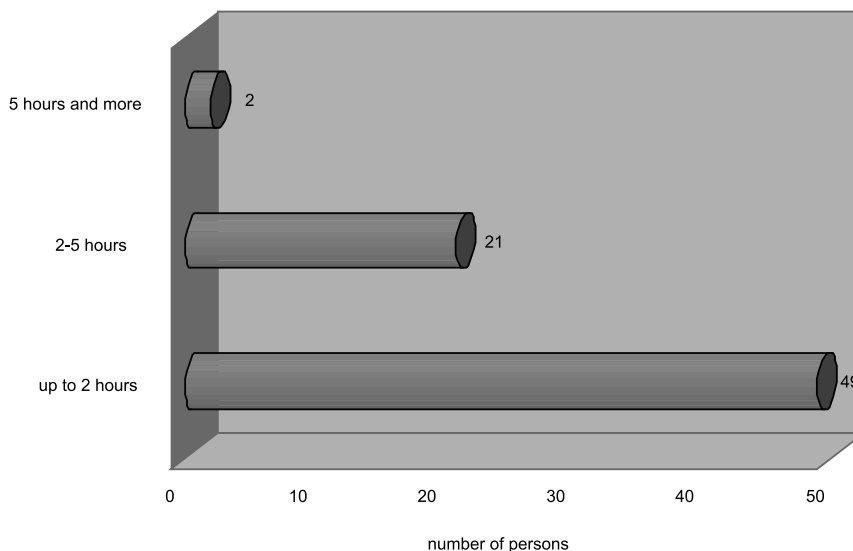


Figure 9. Number of hours spent daily in a sitting position, including watching TV and at the computer (N=74)

Conclusions

1. Krosno University of the Third Age, in its multifaceted statutory activity, carries out in an organized and systematic way many projects that promote active forms of leisure and healthy lifestyle, and the most popular forms of physical activity are classes in the pool, gym and trips and rallies (hiking and cycling). These classes are regularly attended by more than 80% of respondents.
2. The vast majority of respondents (97%) demonstrates a positive attitude towards physical activity, and the primary impetus motivating elderly people to work in this field is the need to exercise and care and attention to their own health (fitness and physical condition).
The internal intention of the respondents to exercise can also be judged from the fact that only the small number of them (8.1%) pointed to the family, while the media as a stimulus appealed to one person.
3. Students of KUTW spend free time in a variety of ways. Among the many forms garden work and walking are the leaders (40% of responses), various forms of physical activity and reading books and gatherings with friends and family (31% response rate). And although we live in the world of television and information technology - the Internet and television, the fact that only a few (17% of respondents) dedicate their free time to sit in front of the media of social communication is comforting.
4. Although almost half of the students outside the University is still professionally active, the majority of respondents (96%) say their physical activity (in it 39% highlight this decisively). The good news is that over 60% of respondents have contact with physical activity outside the University. Also the fact that 34% of respondents spend on it up to 5 hours a week, while 25% do so more than five hours per week is relatively satisfactory. However, it should be emphasized that a large number, as many as 41% of the respondents declare that the amount of time during the week spent by them on physical activity does not exceed two hours per week. Hence, it should be noted that for this large group activities organized by KUTW become the only opportunity to participate in any sports.
5. Among several sport disciplines - mentioned by students as a form of physical activity, hiking is the most popular (72% response rate). More than half of the respondents also indicated cycling, while less than 30% cited Nordic walking and swimming.
6. Among the factors that become to a greater or smaller extent a difficulty for the students of KUTW in the systematic cultivation of their physical activity is the lack of perseverance and consistency (22%) and the excess of domestic and family duties (16%) and unwillingness to exercise (15%). Over 90% of respondents do not see any barriers in the financial aspect. Undoubtedly, this situation should be explained by the fact that the University provides its students with access to the material base of the sport free of charge or at a small payment. It should also be noted that in the last decade sports infrastructure in the city of Krosno has significantly improved.

References:

1. Bergier J. (2012), *Aktywność fizyczna społeczeństwa- współczesny problem (przeгляд badań)*. Człowiek i Zdrowie, Tom VI, nr 1, s. 3-5.
2. Bielski J. (1997), *Życie jest ruchem*, Warszawa.
3. Cendrowski Z. (1997), *Przewodźcą innym, Poradnik dla liderów zdrowia i sportu*, Fundacja Promo-Lider, Warszawa.
4. Cendrowski Z. (1993), *Dekalog zdrowego stylu życia*, Fundacja Promo-Lider, Warszawa.
5. Cynarski W., Bajorek W. (red.) (2009), *Problemy kultury fizycznej i zdrowotnej w ujęciu holistyczno- humanistycznym*, Wydawnictwo Uniwersytetu Rzeszowskiego.
6. Demel M. (1980), *Pedagogika zdrowia*, WSiP, Warszawa.
7. Drabik J. (1995), *Aktywność fizyczna w edukacji zdrowotnej społeczeństwa Cześć I*, Wydawnictwo AWF Gdańsk.
8. Drabik J., Drabik P. (1997), *Wydolność i aktywność fizyczna osób w starszym wieku*. Wychowanie Fizyczne i Sport, nr 3, s.47-54.
9. Gaj J., Hądzelek K. (1997), *Dzieje kultury fizycznej w Polsce*, Poznań.
10. Jethon Z., Wierzbicka- Damska I. (2005), *Zdrowotne znaczenie aktywności ruchowej u osób starszych*. W: Znaczenie aktywności ruchowej dla zdrowia, (red.) E. Murawska-Giałowicz, M. Zatoń, AWF Wrocław.
11. Kopczyńska – Sikorska J. (1981), *Znaczenie aktywności fizycznej w ochronie zdrowia człowieka*, Pedagogika Polska LVI.
12. Osiński W. (2011), *Teoria wychowania fizycznego*, AWF Poznań.
13. Palka S. (2010), *Podstawy metodologii badań w pedagogice*, Wyd. Pedagogika GWP, Gdańsk.
14. Pańczyk W., Warchoł K. (red.) (2011), *Nowe – bliższe zdrowiu wychowanie fizyczne*, Wydawnictwo Uniwersytetu Rzeszowskiego.
15. Rochowicz F. (2008), *Czas wolny uczniów- w świetle aktywności ruchowej i zajęć sedenteryjnych*. Wychowanie Fizyczne i Zdrowotne, nr 3, s. 16- 20.
16. Woźny P. (2013), *Czy można odrzucić aktywność fizyczną*, www.lider.szs.pl/download/268_lider.doc
17. Woynarowska B. (2001), *Kształtowanie prozdrowotnego stylu życia ludności w Polsce*, AWF Warszawa.
18. Woynarowska B. (2010), *Edukacja zdrowotna*, Wydawnictwo Naukowe PWN, Warszawa.

Submitted: 23.04.2014

Accepted: 26.06.2014

THE PECULIARITIES OF THE DAILY PHYSICAL ACTIVITY OF THE PUPILS OF THE GENERAL EDUCATIONAL INSTITUTIONS

Ivan Vaskan¹, Ludmila Vaschuk², Andriy Rostoka²

¹Yuriy Fedkovych Chernivtsi National University in Chernivtsi

²Lesya Ukrainka East European National University in Lutsk

Vaskan I., Vaschuk L., Rostoka A., (2014) *The peculiarities of the daily physical activity of the pupils of the general educational institutions*. Health Problems of Civilization 2 (8), p. 31-34

Summary: The peculiarities of the daily physical activity of the pupils of the general educational institutions of Ukraine are identified in the article. It is stressed that motor activity combines various motor actions and is defined by amount of movements performed by a person in the process of vital activity. For defining of daily motor activity it was used the methodology of timekeeping developed by scientists of Framingham State University for children and teenagers that is based on registration of human activity during a day. For defining the amount of time spent on each kind of motor activity, it was conducted a daily timekeeping of human activities: fixing of time spent on each kind in the succession as they alternated with each other. It is determined that the juveniles' specially organized physical activity makes 0,33–0,44 hrs, it is by 65–70% lower than the hygiene standards. The indices of the daily physical activity of the 11–15-year-old pupils are 31,1 – 33,49 points. The mentioned index among boys is by 0,61–5,75% higher than among girls. Index of daily motor activity among girls increases till the age of 12, after that it decreases gradually. Among boys the highest level of physical activity is revealed at the age of 13–14, after that it is observed decreasing of the results. The level of the pupils' physical activity is determined by the traditions of physical culture at school, by the available material resources, by the level of the professional skills of the teachers of physical culture, educationalists, school authorities.

Key words: physical activity, daily physical activity, pupils, general educational institutions

Introduction

The physical activity combines various motion actions performed in everyday life and labour activity. It plays an important role in the optimal functioning of the person's organism and it is the basis of healthy life (Apanasenko, 1998; Baj - Korpak et al. 2010; Bergier J. et al 2011; Bergier et al. 2012; Cabak, Woynarowska, 2004; Korpak, Bergier, 2011). The physical activity is determined by the amount of actions performed by the person during the process of his vital activity (Krycevuch 2010). At the same time the modern level of the physical activity of the majority of pupils of Ukraine does not correspond to the physiological standards which provide the proper level of the children and juveniles' physical state (Gorobej 1994). The pupils' motion regime makes only 3-4 hours per week at the rate of 2022. The juveniles' daily necessity in actions is complied at the average by 18–22%, that's why the deficiency makes about 80%. Every fifth child of school age and every tenth student has the sufficient level of the curative physical activity. It is one of the lowest indices in Europe. It is caused by the defects of the physical training lessons, low efficiency of out-of-school work, lack of interest in doing physical exercises independently (Bylatova 2008).

The deficiency of the physical activity affects on the children and juveniles' health adversely (Balsevuch, 1987). The problem of compensation of the negative effects of the deficiency of the physical activity by the means of the pupils and students' physical training is still prevailing in the researches of a number of physical training specialists outside Ukraine (Bergier et al. 2010; Biernat et al. 2007; Gacek, 2003).

While measuring the physical activity, the scientists use different criteria and methods which enable us to obtain objective data and we don't need multiplex equipment.

Address for correspondence: Ivan Vaskan, Yuriy Fedkovych Chernivtsi National University, 2 Kotsjubynskiy Str. Chernivtsi 58012, Ukraine
e-mail science-vnu@ukr.net, phone: +380-372-526235

Tables: 1, **Figures:** 2, **References:** 14, **Full text PDF** www.hpc.edu.pl **Copyright** © Pope John Paul II State School of Higher Education In Biała Podlaska, Sidorska 95/97, 21-500 Biała Podlaska **Indexation:** Index Copernicus, Polish Ministry of Science and Higher Education. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-commercial License (<http://creativecommons.org/licenses/by-nc/3.0>), which permits use, distribution, and reproduction in any medium, provided the original work is properly cited, the use is non-commercial and is otherwise in compliance with the license.

The duration of the motion component in a daily “budget” of time which is either a unit of time (in minutes, hours) or in per cents relatively to the duration of a day (24 hours) belong to the criteria and methods. For the last years the continuous recording of heartbeat and the determination of sphygmic “value” of different kinds of actions including the total quantity of the physical activity in a day has been widely used (Krucevuch 2010).

The methodology of timing is based on the recording the kinds of the person’s activity during a day. It lets us obtain all the information about the duration of the certain type of activity, rest, physical exercise, etc. Such a range of options lets us describe this methodology of timing as objective, accurate and informative.

The aim of the research is to identify the peculiarities of the physical activity of the pupils of the general educational institutions.

The methods and structure of the research. The methodology of timing which was worked out by the scientists of Freming University For Children and Juveniles, founded for recording the person’s activity during a day, was used for identifying the daily physical activity (Krycevuch 2010). The following levels of the physical activity among juveniles are singled out:

- ❑ basic level (BL) – sleep, rest lying;
- ❑ sedentary level (SL) – a trip by some vehicle, reading, drawing, watching TV, table and computer games, meals;
- ❑ low level (LL) – personal hygiene, lessons at school (except physical and manual trainings), walking;
- ❑ mean level (ML) – homework, walks, morning exercises, active breaks at school;
- ❑ high level (HL) – plenty of physical exercises during specially organized lessons, active games, running, sledging, skating, cycling, skiing, scootering, roller skating, etc.

The daily timing of the kinds of the person’s activity was conducted to determine the amount of time spent for every kind of the physical activity: we fixed the duration spent for every kind of the activity in the sequence of its interchange. Using Freming methodology of defining the daily physical activity on the basis of timing of different levels of the pupils’ physical activity during a day we are permitted to compare these indices among 11–15-year-old juveniles.

The results of the research and their analysis. The results of the research indicate that the structure of the girls’ daily physical activity consists of the basic level (8,31–8,58 hrs), the sedentary level (6,27–6,49 hrs), the low level (6,17–6,58 hrs), the mean level (2,32–2,52 hrs) and the high level (0,33–0,4 hrs). These indices among boys are similar. In particular, the basic level makes 8,42–8,55 hrs, the sedentary level 6,29–5,3 hrs, the low level 6,37–7,22 hrs, the mean level 2,47–2,57 hrs and the high level 0,36–0,47 hrs. In general the indices of the high and low levels of the physical activity among boys are a little higher (table 1).

The specially organized physical activity which corresponds to the high level of the activity in our research includes various forms of physical exercises, going home and to school, walks. Daily two-hour range of motions which would provide the physiological necessity of organism in physical activity is recommended to the pupils.

Table 1. The structure of the juveniles’ daily physical activity, hrs

The level of the physical activity	SSex	Age, year-old				
		11	12	13	14	15
Basic	GG	8,49±0,03	8,42±0,04	8,31±0,05	8,58±0,04	8,43±0,05
	BB	8,42±0,04	8,55±0,03	8,49±0,04	8,53±0,05	8,47±0,05
Sedentary	GG	6,33±0,32	6,5±0,37	6,49±0,36	6,27±0,43	6,27±0,54
	BB	6,29±0,37	6,14±0,29	5,33±0,33	5,3±0,37	5,54±0,45
Low	GG	6,35±0,41	6,17±0,36	6,44±0,39	6,48±0,42	6,58±0,34
	BB	6,48±0,35	6,37±0,25	7,19±0,31	7,22±0,29	7,14±0,36
Mean	GG	2,48±0,21	2,52±0,24	2,36±0,29	2,32±0,18	2,39±0,24
	BB	2,51±0,33	2,57±0,27	2,55±0,31	2,48±0,25	2,47±0,19
High	GG	0,35±0,04	0,39±0,05	0,40±0,04	0,35±0,04	0,33±0,03
	BB	0,36±0,04	0,37±0,04	0,44±0,05	0,47±0,03	0,38±0,05
The index of the physical activity, points	GG	32,68±0,43	32,82±0,47	32,77±0,33	31,67±0,42	32,58±0,38
	BB	32,88±0,35	32,89±0,43	33,45±0,47	33,49±0,38	31,1±0,29

In general the dynamics of the specially organized physical activity are shown in figure 1.

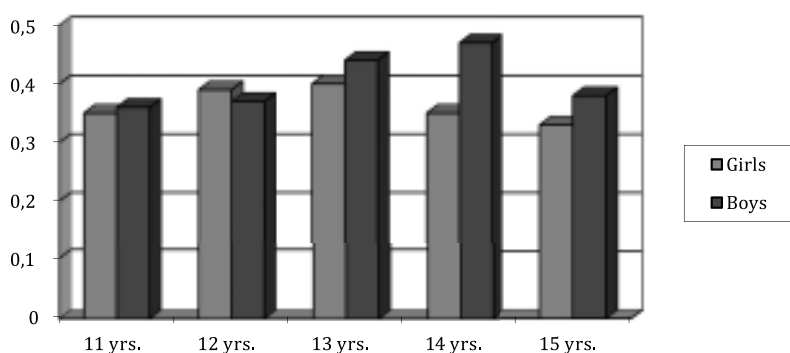


Figure 1. Age dynamics of the juveniles' specially organized physical activity

In different age periods the level of the organized activity varies. The juveniles' specially organized physical activity makes 0,33–0,44 hrs in school practical physical trainings. This index is by 65–70% lower than the hygiene standard.

In order to calculate the index of the juveniles' daily physical activity the amount of hours spent for every kind of activity multiplied by the weighting factor of a certain activity. On the basis of scaling the indices of every kind of the physical activity and the index of the daily physical activity were obtained (Figure 2.).

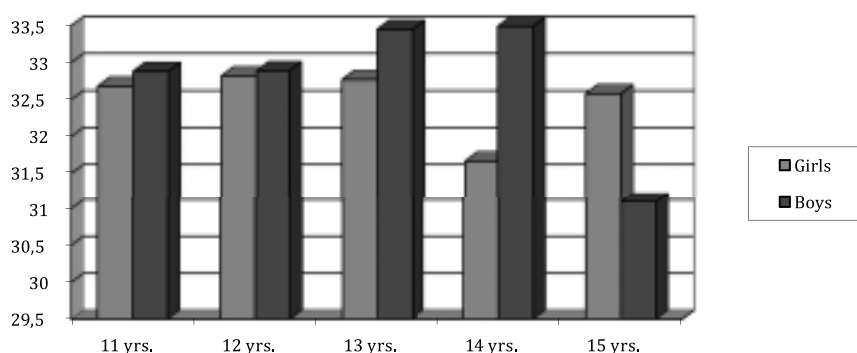


Figure 2. Dynamics of the index of the juveniles' daily physical activity

In general the indices of the daily physical activity of the 11–15-year-old pupils are 31,1–33,49 points. The mentioned index among boys is by 0,61–5,75% higher than among girls. The largest difference is among 13–14-year-old juveniles.

The analysis of the results of the research shows the marginal changes in the dynamics of the index of the physical activity of juveniles of different age groups. The index of the daily physical activity among girls increases up to 12 years, then it begins to decrease gradually. The highest level of physical activity among boys is detected in the age of 13–14 years, then the results decrease. We can assume that decreasing of the physical activity is connected with the reduction of the pupils' motivation and interest in physical culture.

The analysis of the results of the research shows that the traditions of physical culture at school influence upon the level of the pupils' physical activity, the available material resources, the level of the professional skills of the teachers of physical culture, educationalists and school authorities. It is also connected with the underestimation of the curative and educational role of physical culture and with our incomprehension that the physical activity depends upon us to a great extent.

It is determined by the scientific works that the training effect is at a high level of the physical activity. The organizational physical training lessons and intensive sport and outdoor games belong to this level. At the same time this component of the physical activity is appropriate to the overwhelming majority of juveniles only in the form of compulsory lessons of physical culture. If there is no lesson on a certain day, so the high level of the physical activity is lacking.

Having defined the level of the juveniles' physical activity, it can be assumed that it is scarce and it doesn't assist in keeping the proper functional body state.

Conclusion. In the result of the research it is determined that the juveniles' specially organized daily physical activity makes 0,33–0,44 hrs, it is by 65–70% lower than the hygiene standard. The indices of the daily physical activity of the 11–15-year-old pupils are 31,1–33,49 points. The mentioned index among boys is by 0,61–5,75% higher than among girls.

The level of the pupils' physical activity is determined by the traditions of physical culture at school, by the available material resources, by the level of the professional skills of the teachers of physical culture, educationalists, school authorities.

References:

1. Апанасенко Г. Л. (1998), *Медицинская валеология* / Г. Л. Апанасенко, Л. А. Попова. – Киев : Здоровья, – 246 с.
2. Baj-Korpak J., Soroka A., Korpak F. (2010), *Aktywnosc fizyczna wybranych grup społeczno-zawodowych (wszkolnictwie)*. *Człowiek i Zdrowie*, Nr 1 (IV): 152-161.
3. Бальсевич В. К. (1987), *Физическая активность человека* / В. К. Бальсевич, В. А. Запоржанов. – Киев : Здоровья, – 224 с.
4. Bergier J., Bergier B., Soroka A., Kubinska Z. (2010), *Aktywność fizyczna pielęgniarek z uwzględnieniem ich wieku. (Physical activity of nurses with consideration of their age)*. *Medycyna Ogólna* 16 (XLV): 595-605 (in Polish).
5. Bergier J., Kubicska Z., Bergier B. (2011), *Nurses' physical activity with respect to their education*. *Turystyka i Rekreacja*, nr 8.
6. Bergier J., Bergier B., Tsos A. (2012), *Physical activity and sedentary lifestyle of female students from Ukraine*. *Human and Health*. Issue 2. Volume VI: 131-137.
7. Biernat E., Stupnicki R., Gajewski A.K (2007), *Międzynarodowy kwestionariusz aktywności fizycznej (IPAQ) - wersja polska*. *Wych. Fiz. Sport*:51: 47-54.
8. Булатова М. М. (2008), *Сучасні фізкультурно-оздоровчі технології у фізичному вихованні* / М. М. Булатова, Ю. А. Усачов // *Теорія і методика фізичного виховання*; за ред. Т. Ю. Круцевич. – К. : Олімпійська л-ра, – С. 320–354.
9. Cabak A., Woynarowska B. (2004), *Aktywność fizyczna młodzieży w wieku 11-15 lat w Polsce i w innych krajach w 2002 roku*. *Wychowanie Fizyczne i Sport*, 4, 355-366.
10. Gacek M. (2003), *Poziom aktywności ruchowej młodzieży akademickiej w Krakowie*. *Kultura Fizyczna*, 5-6.
11. Горобей М. П. (1994), *Педагогічні умови активізації рухової діяльності молодших школярів у режимі продовженого дня* : автореф. дис. на здобуття наук. ступеня канд. пед. наук : спец. 13.00.01 "Теорія та історія педагогіки" / М. П. Горобей. – К., –22 с.
12. Korpak F., Bergier J. (2011), *Aktywność fizyczna uczniów klas drugich I LO w Białej Podlaskiej*. *Wychowanie Fizyczne i Zdrowotne* nr 1.
13. Круцевич Т. Ю. (2010), *Рекреація у фізичній культурі різних груп населення* / Т. Ю. Круцевич, Г. В. Безверхня. – К. : Олімпійська л-ра, – 248 с.
14. Сухарев А. Г. (1976), *Двигательная активность и здоровье подрастающего поколения* / Сухарев А. Г. – М.: Знание, – 63 с.

Submitted: 28.04.2014

Accepted: 16.06.2014

THE EFFECT EVALUATION OF PHYSICAL EDUCATION EXPERIMENTAL PROGRAM FOR PHYSICAL REHABILITATION GROUPS USING CALLANETICS ON PROGRESS LEVEL OF STUDENTS' CARDIOVASCULAR SYSTEM WITH II-III DEGREE OF SCOLIOSIS

Oksana Dubchuk

Lesya Ukrainka East European National University in Lutsk

Dubchuk O., (2014) *The effect evaluation of physical education experimental program for physical rehabilitation groups using callanetics on progress level of students' cardiovascular system with II-III degree of scoliosis*. Health Problems of Civilization 2 (8), p. 35-39

Summary: Nowadays there is a tendency of deterioration in young people health. Despite sharp rise in disease level of students there are no changes in current program of physical education for students of higher educational institution; it is significant problem of physical culture and sport field. It is also worth noting there is no special educational program for students who are referred to physical rehabilitation groups because of their health condition.

So in the face of the deterioration of students' health condition there appears a need to search the effective methods of physical education which can facilitate the solving of an actual problem. The objective of research is determination of the effectiveness of Callanetics experimentally during educational process of students of the II-III level of scoliosis. For achieving this goal there were used the following methods of research: theoretical analysis and synthesis; testing of functional indicators of cardiovascular system (heart rate and blood pressure – systolic, diastolic and pulse); statistical data processing. The analysis of results gives evidence about effectiveness of physical educational experimental program using callanetics for physical rehabilitation groups with students of the II-III level of scoliosis. It is proved that this program has had a significant impact on the functional indicators of the cardiovascular system, it is also defined as the criterion of fitness level and adaptation abilities of an organism. The results can be used in further practice of physical education classes with groups of physical rehabilitation faculty.

Key words: heart rate, blood pressure, students, scoliosis

Introduction

Today, the specialists in sport and physical education raise the question of a sharp increase in the number of students, which according to health state, are referred to the special departments (Drozd 1998). One reason for deviations in the health state and occurrence of pathological processes accompanied by reduced working performance is violation of posture. (Zaycev 1991).

Posture is an integrating indicator of the health state, and even minor functional disorders can cause a steady deformation of the musculoskeletal system, including scoliosis, and have complex effects on the health of young people (Dubchuk 2012).

Lack of physical activity, lack of conscious motivation to exercise and mandatory procedures for determining the level of physical condition and fitness of students as an important criterion for the quality of the physical education, are major causes of disease increase among students (Buhval, Samchuk 2009, Bouchard, Shephard 1994, Pańczyk, Sądecka 2009).

The huge problem of physical education and sport is that, not paying attention to the level of illnesses among students, the current physical education program for the students of higher educational establishment has not undergone the necessary changes (Shevchenko 2012, Kohl 2001).

It is also necessary to mention that today there is no separate educational program for students which according to health state, are referred to the physical rehabilitation group, which is a big disadvantage (Dubohaj et al. 1996).

It, in the same time, provokes the problematic situation in the practical work of specialists in this sphere that is shown primarily in determining the character of workload: on the one hand, inadequate physical activity can bring the body from the state of compensation and to provoke disadaptation or aggravation of the illness, and on the other – we cannot accept a situation where because of fear of complications in motor regime the physical activity is completely precluded or excessively limited (Pereverzeva 2008, Potashnyuk 2012, Jegier 2003).

Address for correspondence: Oksana Dubchuk, Lesya Ukrainka East European National University in Lutsk, 43005 Peremogy, 25, 34, Lutsk, e-mail: ksjustha-dubchuk@rambler.ru, phone: +38 050 582 48 82

Tables: 1, **Figures:** 4, **References:** 14, **Full text PDF** www.hpc.edu.pl **Copyright** © Pope John Paul II State School of Higher Education In Biała Podlaska, Sidorska 95/97, 21-500 Biała Podlaska **Indexation:** Index Copernicus, Polish Ministry of Science and Higher Education. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-commercial License (<http://creativecommons.org/licenses/by-nc/3.0>), which permits use, distribution, and reproduction in any medium, provided the original work is properly cited, the use is non-commercial and is otherwise in compliance with the license.

So, in conditions of worsening of health state of students there appears the necessity of search of effective methodic of physical education that will promote the salvation of this problem (Corbin et al. 2007). In particular in the practice of physical education there wasn't found enough scientific evidence of organizational-methodological foundations of physical education classes in the groups of physical rehabilitation with using callanetics for students which have scoliosis of II-III level. In view of the above said, we have identified the main goal of our work – to evaluate the effectiveness of the experimental program of physical education for physical rehabilitation groups using callanetics for students with scoliosis of II-III levels.

The main aim of the research is to experimentally identify the effectiveness of callanetics usage in the educational process of students with scoliosis of II-III levels and to analyze its influence on the functional parameters of cardio-vascular system.

Material and methods

For realization of the goal the following research methods were used: theoretical analysis and synthesis; testing of functional parameters of cardiovascular system (heart rate and blood pressure – systolic, diastolic and pulse) statistical analysis of the data.

Findings and discussion

On the chair of physical education and health of Lesia Ukrainka East-European National University there were examined 78 female students from 17-21 years old with scoliosis of II-III level, which according to the state of health were referred to the group of physical rehabilitation. Control group consisted of 34 female students, which worked according to conventional, generally accepted program; experimental group consisted of 44 female students which did callanetics in the condition of academic classes of physical education according to developed methodic.

The program consists of 36 lessons (72 hours), for one academic year. The process of organization and conducting of classes based on the main principles:

- consciousness, realization of which positively influenced the raise of activity of students of physical education.
- individuality – where the individual peculiarities of development, physical state and character of disease were taken into account
- systematic, which allows to save the reached level of students' fitness and as a result to form adaptation possibilities of organism to physical activity.
- principle of consistency, realization of which based on the compliance with fundamental didactic rules (“from light to heavy”, “from easy to difficult”, “from already learnt to new”).

The classes were held once a week in the conditions of academic in the terms of academic classes of physical education, the duration of which was 80 minutes. A special class of experimental program included:

- the introductory part (duration 5 minutes, measurement of heart rate, review of the objectives and finding out the optimal ways to find the solutions for them;
- preparatory part duration: 10-15 minutes, which previewed the execution of general developmental exercises in the movement of low-intensity, stretching exercises and complex of preparatory to callanetics exercises. During the warm-up the heart rate was adjusted to 120-130 beats / min., the rest between workloads was active, the number of repetitions depended on the level of fitness of students.
- the main part (duration 45-50 minutes), which included the complex of callanetics exercises. The exercises based on isometric (duration of keeping static positions up to 1 minute) and titanic (up to 100 contractions in each exercise, which were performed in pulsed regime) types of contractions, which caused the activity of deeply situated muscle groups. Each separate exercise is designed in a way that almost all the muscles of the body are involved in the work. The exercises are executed slowly, without sudden movements and excessive stress. In the starting period the classes included extra rest. The exercises were performed in front of the mirror which provided a better fixation and control of own movements. While execution, the special attention was paid to breathing – arbitrary, without delay, otherwise the body doesn't get the required amount of oxygen. The maximum pulse load in this part didn't exceed 160 beats per minute. The rest between repetitions of exercises was passive. Thanks to frequent repetition there evoked the development of adaptive possibilities of circulatory system to the growing workload and overall increase in the level of fitness.

- final part (duration 5-10 minutes), which assumed performance of exercises for relaxation and passive rest lying on a solid surface, during which the academic discussion aimed on the formation of health saving knowledge was made. The main goal of final part is a transfer of the body from a state of increased functional activity in a state close to the original (reduction of heart rate parameter to 90–100 beats per minute with subsequent return to its initial level in 5 min after the end of the class).

Testing of functional parameters of cardio-vascular system was made to evaluate the effectiveness of physical education classes in the groups of physical rehabilitation and determining the level of organism adaptation to physical exercises.

The most effective and available physiological indicator used to monitor physical activity is the heart rate (Figure 1, Table. 1). Heart-rate is one of the simplest and most accessible indicators of the functional state of the cardiovascular system, in the same time it is quite informative. It is often used as a criterion of the changes in the level of physical fitness. But heart rate is influenced not only by physical exercises, but also by emotional state of person. High heart rate in the state of rest for a long time indicate irrational load during physical education classes and necessity to adjust it according to the functional state and adaptive capabilities of circulatory system of students.

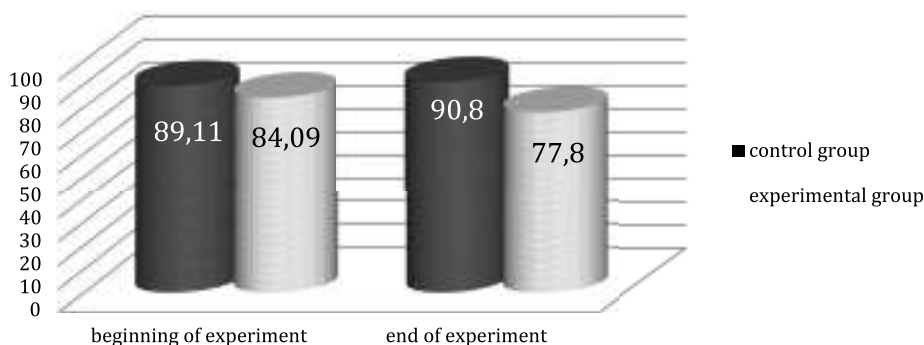


Figure 1. Heart rate level of female students of the physical rehabilitation group with scoliosis of II-III level in the different periods of experiment performance (beats per minute)

Table 1. Parameters of functional possibilities of circulatory system of female students of physical rehabilitation group with scoliosis of II-III level in different periods of experiment performance

Test	Duration of experiment	Group	n	X	S	Sx	V%	t	P
Systolic blood pressure (mm Hg.)	in the beginning of experiment	control	34	119,2	2,1	0,4	1,8	-8,440	<0,001
		experimental	44	115,3	1,9	0,3	1,6		
	in the end of experiment	control	34	123,67	1,96	0,34	1,6	-28,632	<0,001
		experimental	44	112,72	1,21	0,18	1,1		
Diastolic blood pressure (mm Hg.)	in the beginning of experiment	control	34	74,7	0,9	0,1	1,2	0,828	>0,05
		experimental	44	76,1	1,3	1,7	1,7		
	in the end of experiment	control	34	75,58	1,01	1,17	1,3	-2,187	<0,05
		experimental	44	71,8	1,11	1,72	1,5		
Pulse blood pressure (mm Hg.)	in the beginning of experiment	control	34	44,6	2,2	0,4	4,8	-12,744	<0,001
		experimental	44	39,2	1,3	0,2	3,3		
	in the end of experiment	control	34	48,08	1,9	0,33	4,0	-19,274	<0,001
		experimental	44	40,09	1,7	0,26	4,2		
Heart rate (beats/minute)	in the beginning of experiment	control	34	89,1	0,7	0,1	0,8	-16,723	<0,001
		experimental	44	84,1	1,8	0,3	2,2		
	in the end of experiment	control	34	90,82	1,92	0,33	2,1	-32,500	<0,001
		experimental	44	77,81	1,51	0,23	1,9		

The research of heart rate allowed to reveal a statistically significant reduction to 7,9 % at a female students from experimental group ($p < 0,001$) compared to students from the control group, the indicator of which raised a bit, but not significantly ($p < 0,05$).

The research of blood pressure (Figure 2,3,4, Table. 1) involved the determination of the following parameters: SBP, DBP and the PSC, the level of which depends on stroke volume and cardiac reserve capacity of the arterial system. The research of it has a particular interest, because the smaller this interest is the less blood during systole comes from the ventricles into the aorta. The research of systolic blood pressure testifies the smaller indicators ($p < 0,001$) of female students from experimental group ($112,72 \pm 1,21$) comparing with control group ($123,7 \pm 1,9$) (Figure 2.).

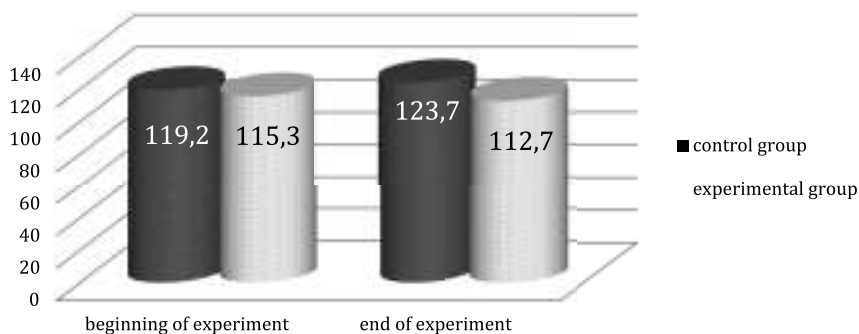


Figure 2. Level of systolic blood pressure of female students from physical rehabilitation group with scoliosis of II-III levels in the different periods of experiment performance (mm Hg)

The research of diastolic blood pressure showed the reduction of its level at female students from experimental group ($71,8 \pm 1,1$) with very high statistical reliability ($p < 0,001$), in the control group its indicators didn't significantly change (Figure 3.).

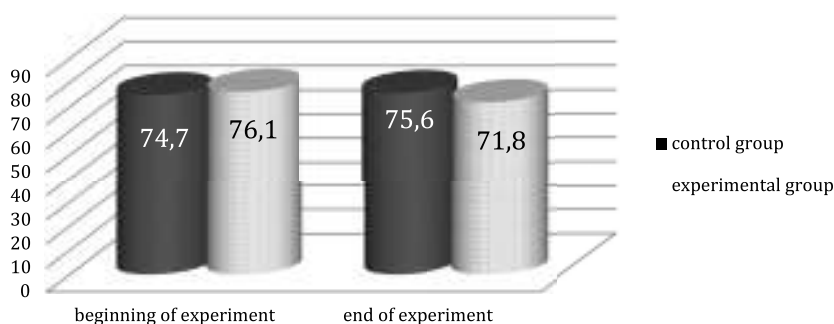


Figure 3. Level of diastolic blood pressure of students from physical rehabilitation group with scoliosis of II-III level in different periods of experiment performance (mm Hg)

The measurement of pulse blood pressure, which characterizes motive power of blood circulation affirmed significantly better results in the experimental group ($40,1 \pm 1,7$), than in control ($48,1 \pm 1,9$). Thus the index of statistical reliability was very high ($p < 0,001$) (Figure 4.).

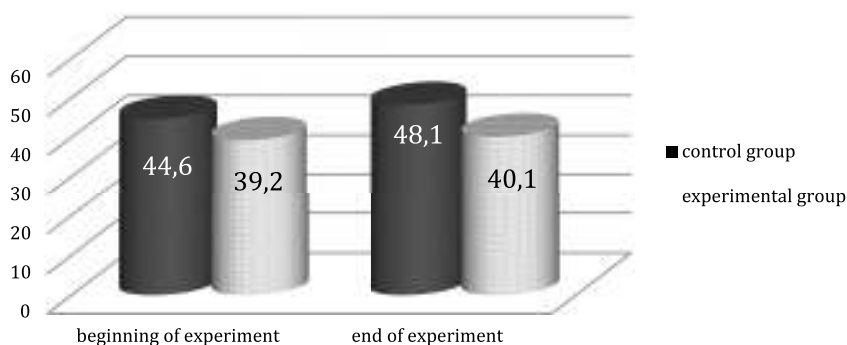


Figure 4. The level of blood pressure of students from physical rehabilitation group with scoliosis of II-III level in different periods of experiment performance (mm Hg)

So, conducted researches, according to evaluation of functional indicators of cardio-vascular system, proved the effectiveness of callentics classes in this contingent of patients.

Conclusions

Methodically sound organization of physical education with students from specialized departments causes the complex of changes in the organism, which significantly broadens the functional possibilities of organs and systems and raises the resistance to negative influence of factors from external environment and increases the adaptive possibilities of organism.

It was experimentally proved that a program of physical education for the groups of physical rehabilitation which practice callentics is developed basing on individual characteristics of physical state and physical development of students with scoliosis of II-III level, that it contributed to the growth of fitness and adaptive possibilities of circulatory system, through the reduction of heart rate, systolic and diastolic blood pressure and normalization of pulse blood pressure of female students from experimental group.

The analysis of obtained results affirms the effectiveness of experimental program of physical education for the groups of physical rehabilitation, using callentics for students who suffer from scoliosis. It is expected that obtained results of the research can be used in the further practice of organization and conducting of physical education classes in the groups of physical rehabilitation for students with scoliosis.

References:

1. Бухвал А.Самчук О. (2009), Стан здоров'я студентів вищих навчальних, Фізичне виховання, спорт і культура здоров'я у сучасному суспільстві : зб. наук. пр. Волин. нац. ун-ту ім. Лесі Українки, № 3 (7), РВВ «Вежа» Волин. нац. ун-ту ім. Лесі Українки, Луцьк, стор. 52–55.
2. Дрозд О. (1998), Фізичний стан студентської молоді західного регіону України та його корекція засобами фізичного виховання: автореферат дис. на здобуття наук. ступеня канд. пед. наук, Київ, 24 стор.
3. Дубогай О., Завацький В. (1996), Методика фізичного виховання студентів, віднесених за станом здоров'я до спеціальної медичної групи, Надстир'я, Луцьк, 222 стор.
4. Дубчук О. (2012), Оцінка фізичного стану студентів групи фізичної реабілітації вищих навчальних закладів, Фізичне виховання, спорт і культура здоров'я у сучасному суспільстві : зб. наук. пр. Волин. нац. ун-ту ім. Лесі Українки, № 4 (20), РВВ «Вежа» Волин. нац. ун-ту ім. Лесі Українки, Луцьк, стор. 364–369.
5. Зайцев П. (1991), Контроль за динамікою состояния здоровья и двигательной активности студентов, Вопросы физического воспитания студентов, Вып. 22, Москва, стор. 3–6.
6. Переверзева И. (2008), Технология проведения занятий в специальном медицинском отделении : учеб-метод. пособие, Ульяновск : [б. и.], 58 стор.
7. Поташнюк Р. (2012), Методологічні підходи до дослідження проблеми підготовки майбутніх фахівців здоров'я людини до здоров'язбережувальної діяльності, Фізичне виховання, спорт і культура здоров'я у сучасному суспільстві : зб. наук. пр. Волин. нац. ун-ту ім. Лесі Українки, № 2 (18), РВВ «Вежа» Волин. нац. ун-ту ім. Лесі Українки, Луцьк, стор. 77–80.
8. Шевченко А. (2012), Новітні підходи до професійної підготовки майбутнього вчителя фізичної культури, Фізичне виховання, спорт і культура здоров'я у сучасному суспільстві : зб. наук. пр. Волин. нац. ун-ту ім. Лесі Українки, № 4 (20), РВВ «Вежа» Волин. нац. ун-ту ім. Лесі Українки, Луцьк, стор. 115–3119.
9. Bouchard C., Shephard R. J. (1994), Physical activity, fitness, and health: the model and key concepts, In: Physical activity, fitness, and health. ed. C. Bouchard, R. J. Shephard, T. Stephens, Physical activity, fitness, and health, Human Kinetics, Champaign.
10. Corbin Ch.B., Welk G.J., Corbin W.R., Welk K.A. (2007), Fitness I wellness – kondycja, sprawność, zdrowie. ZYSK i S-KA, Poznań.
11. Jegier A. (2003), Aktywność ruchowa w promocji zdrowia oraz zapobieganiu i leczeniu chorób przewlekłych. *Medicina Sportiva*, nr 7 (supl. 1):27-36.
12. Kohl H. W. III (2001), Physical activity and cardiovascular disease: evidence for a dose response. *Medicine & Science in Sport Exercise*, no. 33 (suppl.): 370-378.
13. Pańczyk W, Sądecka D. (2009), Aktywność fizyczna w stylu życia studentów a zdrowie. W: Edukacja zdrowotna szansą na poprawę jakości życia człowieka. red. M. Wolicki, B. Wolny, W. Pańczyk. KUL. Stalowa Wola, 140-151.

Submitted: 22.04.2014

Accepted: 11.06.2014

THE CHARACTERISTIC OF PHYSICAL DEVELOPMENT OF THE POPULATION UNDER INFLUENCE OF THE ANTHROPOGENIC FACTORS

Oksana Usova¹, Oleksandr Sologub¹,
Vitalii Dmytruk², Wolodymyr Kovalchuk²

¹Lesya Ukrainka East European National University in Lutsk

²Lutsk National Technical University

Usova O., Sologub O., Dmytruk V., Kovalchuk W. (2014) *The characteristic of physical development of the population under influence of the anthropogenic factors*. Health Problems of Civilization 2 (8), p. 40-43

Summary: Having analyzed features of physical development of the teenagers in a zone of the radiation control and intensive agriculture, in comparison with the teenagers from ecologically clean regions, it is necessary to note, that the parameters of proportionality do not fall outside the limits of the established age norms. It is possible to explain their decrease (at the expense of reduction of weight in the majority examinees) by intensive growth of a skeleton in length and smaller rates of muscles development. We have not revealed essential differences of the parameters depending on the residence of the examinees. As to the adults, weight-growth parameters of the men from the zone of the radiation control exceed reference parameters (due to the greater height, weight and thorax measurements). All examinees of the control group and men, engaged in agrarian sector, belong to a normal type, and the women of the last group have the lowest weight and height parameters.

Key words: body mass indexes, teenagers, radiation, pesticides

A number of derivative indexes and figures are taken into account for the purpose of evaluation of body proportions and harmony of development. The indexes that were suggested during previous years had specified values of the figure for all children or definite age groups. Contemporary indexes do not limit the evaluation of the child development up to one figure. They are used on equal terms with regional standards built according to the sex and age, which made them more accurate and valuable (Калиниченко 2009, Романенко 2012, Сергиенко 2013, Cole et al 2007, Reiman et al. 2009) The comparison of the results of physical development and physical preparedness of the schoolchildren, which reside on the radiation polluted territory, as compared to the school children residing in relatively clean regions, shows the difference in favour of the "clean" territories (Данчук 1998 Москвіна 2006, Cherry et al. 2007)

Methods and materials. The experiment was carried out with the help of anthropometrical methods of the height, weight and thorax measurements evaluation. Indexes of physical development were evaluated on the basis of measurement data. 60 teenagers (30 males and 30 females) and 110 adults (55 males and 55 females) were examined. All the examinees were divided into three groups: 1) Control group - the inhabitants of the relatively clean ecological region; 2) Test group #1 (TG1) - the inhabitants of the region with the heightened radiation level; 3) Test group #2 (TG2) - the inhabitants of the agrarian regions.

Results. On the basis of our investigation, the body length of male-teenagers belonging to the victims of Chernobyl Tragedy of the 3d-4th categories and teenagers of the control group do not have statistically significant differences. The regularity of the same sort was revealed as to the height of teenagers residing in the rural regions. The body length of the female-teenagers, belonging to the TG1 is smaller then in the control group: 158,8±1,52 cm 164,9±1,48 cm (table 1).

Address for correspondence: Oksana Usova, Lesya Ukrainka East European National University in Lutsk, Prosp. Woli, 13, m. Luck 43025, Ukraine, e-mail: alex_uas@ukr.net phone: +38 050 762 39 37

Tables: 4, **Figures:** 0, **References:** 11, **Full text PDF** www.hpc.edu.pl **Copyright** © Pope John Paul II State School of Higher Education In Biała Podlaska, Sidorska 95/97, 21-500 Biała Podlaska **Indexation:** Index Copernicus, Polish Ministry of Science and Higher Education. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-commercial License (<http://creativecommons.org/licenses/by-nc/3.0>), which permits use, distribution, and reproduction in any medium, provided the original work is properly cited, the use is non-commercial and is otherwise in compliance with the license.

Table 1. Anthropometric indicators of teenagers victims of the Chernobyl accident n=40

№	Indicators	Boys (n=20)		Girls (n=20)	
		Test group #1	Control group	Test group #1	Control group
1.	Height (m), cm	163,70±3,24	164,40±4,24	158,8±1,52*	164,9±1,48
2.	Weight (h), kg	51,80±3,35	50,80±4,25	47,10±2,04	52,80±2,74
3.	Girth of thorax (y), cm	73,5±5,01	76,10±3,27	73,10±1,46	77,70±2,13
4.	Age, (q), years	15,00±0,26	14,4±0,43	15,4±0,22	15,3±0,26

Notes: * - significance of differences between boys I and control groups (p <0,05);

** - significance of differences between girls I and control groups (p <0,05)

The same situation was marked for the body length of the adults, the only exception is male examinees of TG2: their height is relatively bigger then in the control group: 181,00±1,6 cm and 177,75±1,79 cm accordingly with p>0,05 (table 2).

Table 2. Anthropometric indicators of teenagers living in rural areas n=40

№	Indicators	Boys (n=20)		Girls (n=20)	
		Test group #2	Control group	Test group #2	Control group
1.	Height (m), cm	164,50±2,63	164,40±4,24	166,4±2,65	164,9±1,48
2.	Weight (h), kg	50,40±3,63	50,80±4,25	55,10±2,29	52,80±2,74
3.	Girth of thorax (y), cm	70,75±2,25	76,10±3,27	78,40±1,47	77,70±2,13
4.	Age, (q), years	14,70±0,15	14,4±0,43	15,6±0,31	15,3±0,26

Notes: * - significance of differences between boys II and control groups (p <0,05);

** - significance of differences between girls II and control groups (p <0,05)

The body weight of the examinees teenagers TG1 and TG2 does not differ much from the control. But the body weight of the female-teenagers TG1 is relatively less 47,10±2,04 kg and 52,80±2,74 kg with p>0,05 (table 1, 2).

The body weight of women of the early reproductive age belonging to the TG1 and TG2 does not differ from the figures of the control group. Men of the TG1 have the tendency to the increase of this parameter as compared to the control group: 71,40±1,63 kg and 66,75±2,39 kg with p>0,05 (t=1,61). At the same time the body length does not differ from the control group (table 3, 4).

Table 3. Anthropometric indicators of adult victims of the Chernobyl accident n=80

№	Indicators	Mens (n=40)		Womens (n=40)	
		Test group #1	Control group	Test group #1	Control group
1.	Height (m), cm	177,9±1,24	177,75±1,79	162,80±1,51	163,4±1,19
2.	Weight (h), kg	71,40±1,63	66,75±2,39	57,15±2,62	55,10±1,86
3.	Girth of thorax (y), cm	96,25±1,26*	88,00±1,76	88,30±1,95*	80,10±1,91
4.	Age, (q), years	22,05±0,23	21,65±0,51	20,35±0,46	21,20±0,43

Notes: * - significance of differences between men I and control groups (p <0,05);

** - significance of differences between women I and control groups (p <0,05)

Table 4. Anthropometric indicators of adults who live in rural areas n=70

№	Indicators	Mens (n=35)		Womens (n=35)	
		Test group #2	Control group	Test group #2	Control group
1.	Height (m), cm	181,00±1,6	177,75±1,79	163,23±1,76	163,4±1,19
2.	Weight (h), kg	74,87±2,53*	66,75±2,39	56,40±2,54	55,10±1,86
3.	Girth of thorax (y), cm	93,07±2,26	88,00±1,76	74,13±1,88**	80,10±1,91
4.	Age, (q), years	21,47±0,42	21,65±0,51	21,73±0,81	21,20±0,43

Notes: * - significance of differences between men II and control groups (p <0,05);

** - significance of differences between women II and control groups (p <0,05)

The weight of the men residing in the rural regions is greater than in the control group: $74,87 \pm 2,53$ kg and $66,75 \pm 2,39$ kg ($p < 0,05$) (table 3, 4) (table 4).

We have not revealed the reliable differences in the thorax measurements between teenagers of all the groups. There were marked smaller values of this parameter among the female-teenagers residing in the radiation polluted regions: $73,10 \pm 1,46$ cm and $77,70 \pm 2,13$ cm with $p > 0,05$ ($t = 1,78$). For the thorax measurements of the male-teenagers from agrarian territories there was marked the same regularity: $70,75 \pm 2,25$ cm and $76,10 \pm 3,27$ cm with $p > 0,05$ ($t = 1,35$) (table 1, 2).

As to the adults residing in the radiation polluted regions, the thorax measurements are greater than in the control group. For males: $96,25 \pm 1,26$ cm and $88,00 \pm 1,76$ cm accordingly ($p < 0,05$). For females: $88,30 \pm 1,95$ cm and $80,10 \pm 1,91$ cm accordingly ($p < 0,05$) (table 3).

Among the men of rural residence the tendency to the increase of the chest measurement was revealed $93,07 \pm 2,26$ cm and $88,00 \pm 1,76$ cm. But the difference between the values is not reliable ($t = 1,77$). The value of the chest measurements of the TG2 women is less than in the control group: $74,13 \pm 1,88$ cm and $80,10 \pm 1,91$ cm accordingly ($p < 0,05$) (table 4).

The analysis of receiving results shows that for teenager's body any mass indexes differences which have a statistic value are absent. All teenagers which were examined drop a simple body mass index at the expense (in most cases) of the drop of mass of a body was noticed. Despite this, girls who live in a countryside have tendency to augmentation of this index in comparison with control group is marked: $33,03 \pm 0,96$ kg/m and $29,26 \pm 3,21$ kg/m at $p > 0,05$ ($t = 1,13$) (table 1, 2).

The parameters of body mass indexes of men TG1- and control group are normal though there is no authentic difference between them, but the tendency to augmentation of its parameter is observed: $39,99 \pm 0,72$ kg/m and $37,31 \pm 1,21$ kg/m at $p > 0,05$ ($t = 1,90$) (table 3).

The size of TG2-group men's body mass indexes is more than in control group: $41,31 \pm 1,23$ kg/m and $37,31 \pm 1,21$ ($p < 0,05$). Thus the size of an index in TG2 group slightly exceeds limits of norm (table 4).

Between body mass indexes of women of examinees groups and control group there is no revealed authentic differences. All examined females have the value of the elementary body mass index which is lower than norm (table 3, 4).

The size of men's Kettle index in TG1-group is more, than in control group: $22,48 \pm 0,35$ kg/m² and $20,98 \pm 0,64$ kg/m² ($p < 0,05$). A similar regularity is peculiar to men of TG2-group: $22,82 \pm 0,65$ kg/m² and $20,98 \pm 0,64$ kg/m² ($p < 0,05$).

The Rorer's index and body mass half index for men who live in the radioactive polluted districts, is greater in comparison with the control: $12,61 \pm 0,20$ kg/m³ and $11,82 \pm 0,37$ kg/m³ $p > 0,05$ ($t = 1,88$); $80,00 \pm 1,44$ kg/(kg*1/2h) and $74,61 \pm 2,58$ kg/(kg*1/2h) $p > 0,05$ ($t = 1,82$). Men from countryside have the last parameter also higher than in control group and is equal according to $86,62 \pm 2,46$ kg/(kg*1/2h) and $74,61 \pm 2,58$ kg/(kg*1/2h) at $p < 0,05$.

On the average, examined teenagers concern to narrow-chested (an index of proportionality less than 50 %). For IP examinees of the TG1-group belong to normosthenic type, and control group to asthenic. Thus the first can be ranked to wide-chested, and the others to normal type.

The men from a countryside have these parameters higher in comparison with control group, but anyhow $p > 0,05$. In both groups the value IP makes relative norm. The size of these parameters for women of TG2-group is lower, than in group of comparison ($p < 0,05$). According to IP women of TG2-group belong to asthenic type, and women of the control group - to normosthenic.

Discussion. Thus, all examined teenagers are asthenics. Adults who live in the radioactive polluted terrain, can be conventionally referred to hypersthenic type, whereas those under control to normosthenic type. Men who live in countryside belong to normosthenic, and women to asthenic. The results of the previous research (Козлова, 1998) testify as well, that there are no differences in the height of bodies of practically all schoolchildren's age-grades of Chernobyl zone and pure zone. At the same time, the inspections [Приймак et al. 1998] haven't revealed any probable difference between parameters of body height. We have not revealed probable deflections between body height of examinees.

The results of scientific research show, that children who live in Chernobyl zone have obviously smaller parameters of a thorax measurements (Данчук, 1998). And other researchers have not found any obvious difference behind this parameter (Чижик, 1994). The results of our research are also a proof of the last literary data.

References:

1. Данчук П.С. (1998), Исследование двигательной подготовленности младших школьников в зависимости от продолжительности их проживания в зоне повышенной радиоактивности. Фізична культура, спорт та здоров'я нації: Збірн.наук. праць; 3:125-128.

2. Калиниченко І. (2009), Інформативність індексних способів оцінки соматотипів у дітей. Фізичне виховання, спорт і культура здоров'я у сучасному суспільстві: збірник наукових праць; 3: С. 72-75.
3. Козлова К.Ф. (1998), Сравнительная характеристика физического состояния школьников, проживающих в зоне радиоактивного загрязнения Украины. Фізична культура, спорт та здоров'я нації: Збірн.наук. праць; 2: 158-166.
4. Москвіна, Т.П. (2006), *Наслідки Чорнобильської катастрофи: освітньо-оздоровчий аспект*. Вісник Житомирського державного університету імені Івана Франка; 29: 49-51.
5. Приймак С.Г., Ущенко З.Д., Гайова Н.В. (1998), Залежність функціональних показників від морфологічних ознак дітей та підлітків, що мешкають в зоні радіоактивного забруднення, внаслідок аварії на ЧАЕС. Фізична культура, спорт та здоров'я нації: Збірн.наук. праць; 3: 197.
6. Романенко В.А. (2012), Генетические детерминанты физического статуса человека на различных этапах онтогенеза. Педагогіка, психологія та медико-біологічні проблеми фізичного виховання і спорту; 8: 74-78.
7. Сергиенко В.Н. (2013), Морфологические показатели студенток 17–20 лет высших учебных заведений. Фізическое воспитание студентов; 6: 73-77.
8. Чижик В.В. (1994), Особливості фізичного розвитку 14-15-річних хлопчиків-підлітків на забруднених радіонуклідами територіях Волинської області. Матеріали міжнародної науково-практичної конференції „Фізична культура, спорт та здоров'я нації; 1: 397-398.
9. Cherry DC, Huggins B, Gilmore K (2007) *Children's Health in the Rural Environmen*. Pediatric Clinics of North America; 54(1): 121–133.
10. Cole TJ, Flegal KM, Nicholls D, Jackson AA (2007), *Body mass index cut offs to define thinness in children and adolescents: international survey*. BMJ ; 335:194.
11. Reiman M. P., Manske R.C. (2009), *Functional Testing in Human Performance*; Champaign, IL: Human Kinetics: 308.

Submitted: 03.04.2014

Accepted 17.06.2014