

Multiprogramme dynamic electrostimulation in rehabilitation of patients with the central and peripheral nervous system diseases

Ludmila Chernikova, prof., DM¹, **Nadezhda Toropova**, MSc¹, **Tatiana Razinkina**, MSc¹, **Valeriy Domanskiy**, Dr, PhD², **Ygor Sobakin**, MSc², **Sergey Koshelev**, MSc², **Sergey Kostyukovskiy**, MSc³

¹Scientific neurology center RAMS, Moscow, Russian Federation; ²Scientific Technological Centre of Unique Instruments RAS, Moscow, Russian Federation; ³Design office Pyrocelc Ltd, Moscow, Russian Federation

Coorepondence: Valeriy Domanskiy; e-mail: domanski@mail.ru

Background: Motor violations in the form of paresis of various localizations and etiologies often occur at defeats of the central and peripheral structures of nervous system. They are the main indication to the neuromuscular electrical stimulation (ES). The application of ES directly activates big alpha motoneurons, as well as creates facilitating effect from skin afferents on them (1). The efficiency of ES is mainly defined by its parameters and modes. The goals of the proposed research were to investigate physiological justifications of parameters of ES and to elaborate new devices and software for clynical practice. **Methods:** The efficiency of ES different parameters at different types of paresis and denervation was studied. The indications were defined individually, according to the data of clinical inspection and electrophysiological researches by electromyography. **Results and discussion:** As it was shown, at peripheral paresis, depending on the degree of a muscle denervation pulses of various durations are used. In the case of absence or weak axon degeneration short pulses of 0.1–1.0 ms duration are optimal. At a partial denervation of a muscle pulses of 1–10 ms are effective. And finally, at a rough denervation pulses of 100–300 ms duration are necessary. The presence of a constant (galvanic) component of a range of incentives increases the destruction of cellular membranes and electrolytic destruction of the active surface of electrodes. At central paresis of a various etiology, the condition of the neuromuscular structure usually remains intact. In these cases, for ES of muscles alternating currents of the sound range (2–20 kHz in frequency) were used. During the pilot and clinical studies in norm and at various types of pathology, a number of dynamic types of activity for different groups of muscles of the slow, fast and mixed types were determined (2). In the majority of stimulators available in clinical practice, the ES parameters are set by the operator before the session. They either remain fixed before the end of the session, or are corrected manually within it. Under these conditions the effect of ES is far from an optimum. For optimization of the compliance of ES parameters with the initial and changing condition of a stimulated link we created new generation of stimulators of the “Omnistim” series (3–5). Their sets of programs of dynamic ES are realized which correspond to the criteria given above which can be expanded and modified according to specifics clinical tasks. **Conclusions:** The elaboration of new devices for ES allows minimizing the energy of ES action, to reduce side effects; to achieve a physiologically optimal mode of muscular activity, and to provide with the comfort of action at high intensities of muscular contractions.

Keywords: nerve stimulation; paresis; stimulator; parameters.

References

1. Nelson RM, Curried DP (1987). Clinical electrotherapy. Norwalk Connecticut: Appleton & Lange, 295.
2. Domanskiy VL (2002). Biophysical and clinical criteria for stimulation parameters selection. In: Proc. of Conf. "Electrostimulation-2002". Moscow, 324–8.
3. Domanskiy VL, Koshelev SM, Sobakin IA (2008). Multiprogramme four-channel electrical neuro-stimulator. In: Proc. of Internat. Conf. on Biomedical Engineering. Moscow, 161–2.
4. Domanskiy VL, Sobakin IA, Koshelev SM (2008). Creation of series of unificated neurostimulators. In: Proc. of Internat. Conf. on Biomedical Engineering. Moscow, 162–3.
5. Chernikova LA, Toropova NG, Razinkina TP, Sharypova TN, Domanskiy VL (2008). The role of multiprogramme dynamic electrostimulation in rehabilitation of patients with the central nervous system lesions. In: Proc. of Internat. Conf. on Biomedical Engineering. Moscow, 324–8.

Uporaba različnih fizioterapevtskih postopkov pri rehabilitaciji pacienta po rekonstruktivni operaciji roke – poročilo o primeru

Renata Javornik, dipl. fiziot.¹; **Božena Primožič**, dipl. fiziot.¹; prim. asist. **Erik Vrabič** dr. med., spec. plast. in rekonstrukc. med.²; prim. doc. dr. **Breda Jesenšek Papež**, dr. med., spec. fiz. in rehab. med.¹

¹Inštitut za fizikalno in rehabilitacijsko medicino, Univerzitetni klinični center Maribor, Slovenija; ²Oddelek za plastično in rekonstrukcijsko kirurgijo, Univerzitetni klinični center Maribor, Slovenija

Korespondenca/Correspondence: Renata Javornik; e-pošta: javornikr@gmail.com

Uvod: Pri vsakodnevem delu fizioterapevtov je zelo pomembno preiti iz teorije v prakso. Pri uspešnem izvajanju fizioterapevtskih programov je potrebno redno strokovno izobraževanje. Pridobljeno znanje o novih tehnikah in pristopih v fizioterapiji pa je nato mogoče uporabiti pri vsakodnevem delu z bolniki. Namen je predstavitev uporabe različnih fizioterapevtskih metod in tehnik pri rehabilitaciji po zelo težki poškodbi in operaciji roke. Pri delni amputaciji roke je bil uspešno uporabljen mikrokirurški poseg. Primarni cilj fizioterapevtske rehabilitacije po operaciji je bil doseči čim višjo raven funkcionalnosti bolnikove roke. **Metode:** Delavec, star 31 let, se je poškodoval pri delu z rezkalnim strojem. Roka je bila v zapestju skoraj v celoti amputirana. Po rekonstruktivni operaciji smo začeli uporabljati več tehnik aktivnih in pasivnih fizioterapevtskih metod. Izkušen fizioterapevt je izvajal različne tehnike: kinezioterapijo, elektroterapijo, krioterapijo, magneto terapijo, ultrazvok in nevrromuskularne trake. Da bi zmanjšali bolečino in povečali obseg gibljivosti, mišično moč in koordinacijo, so bile uporabljene tudi tehnike, kot so sklepna mobilizacija, proprioceptivna nevrromuskularna facilitacija (PNF) z zadrži-sprosti gibanjem in frikcijska masaža. **Rezultati:** Mikrokirurški poseg in rehabilitacija z uporabo različnih fizioterapevtskih metod in tehnik sta vodila do popolne možnosti uporabe roke. Uspešna fizioterapevtska obravnava je pomagala bolniku, da lahko skoraj popolnoma normalno uporablja roko. **Zaključki:** Dobro in vzajemno sodelovanje med mikrokirurgom in fizioterapevtom je po operacijskem posegu in rehabilitaciji z različnimi fizioterapevtskimi metodami in tehnikami dalo zelo dobre rezultate. V fizioterapevtski obravnavi bolnikov je prav tako zelo pomembno sodelovanje med fizioterapevtom in bolnikom, saj mora bolnik aktivno sodelovati, da je zdravljenje čim bolj uspešno. Bolnik se je lahko vrnil k svojim normalnim dnevnim aktivnostim skoraj brez zmanjšanja zmožnosti uporabe poškodovane roke.

Ključne besede: poškodba roke, fizioterapevtske metode, fizioterapevtske tehnike, rehabilitacija.

The use of various physiotherapy procedures in rehabilitation of a patient after reconstructive hand microsurgery – a case report

Background: Permanent education and training is very important for successful implementation of physiotherapeutic programmes. To achieve that purpose, the acquired knowledge about new physiotherapeutic methods and techniques has to be incorporated into everyday work with patients. The purpose is to present the physiotherapy methods and techniques used on a patient with severe hand amputation after the reconstructive microsurgery. The goal of post microsurgical rehabilitation was to achieve a full function of the repaired hand. **Methods:** A 31-year old worker has sustained an injury working on the milling machine. He had almost completely amputated hand at the wrist. After reconstructive surgery both passive and active physiotherapy procedures were started. Experienced physical therapists performed various types of physiotherapy: kinesiotherapy, electrotherapy, cryotherapy, magnetic therapy, ultrasound and neuromuscular tape. The techniques used were also joint mobilization, proprioceptive neuromuscular facilitation (PNF) with hold-relax motion and transverse friction massage. **Results:** The microsurgery together with the rehabilitation using a combination of physiotherapy methods and techniques has lead to the patient's full recovery. The successful therapy helped to resume the normal use of the patient's hand after undergoing treatment. **Conclusions:** With emphasis on the rehabilitation of hand trauma, our surgeons and physical therapists specializing in hand rehabilitation worked closely with the patient to achieve the best results. This cooperation has helped the patient to return to normal day-to-day activities with only minor loss of capabilities or limitations after the severe hand injury.

Keywords: hand injury, physiotherapeutic methods, physiotherapeutic techniques, rehabilitation.

Literatura/References

1. Blow D. Neuromuscular Taping from theory to practice (2012). Milan: Edi-ermes, 350–358.
2. Weinzweig J, Watson KH (2001). The wrist. Philadelphia: Lippincott Williams & Wilkins, 757–77.
3. Green DP (1999). Green's operative hand surgery. 6th ed. Philadelphia: Churchill Livingstone, 1607–31.
4. Kapandji IA (1987). The Physiology of the joints: The upper limb. Philadelphia: Churchill Livingstone, 65–89.
5. Prentice W (2005). Therapeutic modalities in rehabilitation. 4th ed. New York: McGraw-Hill Medical, 70–80.

Učinkovitost šole proti bolečini v hrbtenici

Slavica Bajuk, dipl. fiziot., **Nada Naglič**, dipl. fiziot., **Sonja Kokalj**, dipl. fiziot., **Jana Vidmar**, dipl. fiziot., **Katja Jere**, viš. fiziot., **Jožica Podbevšek**, dipl. fiziot., **Katja Gregorčič Trček**, dipl. fiziot., **Nuša Klar**, dipl. fiziot.

Univerzitetni Rehabilitacijski Inštitut – Soča, Ljubljana, Slovenija

Korespondenca/Correspondence: Slavica Bajuk; e-pošta: slavica.bajuk@ir-rs.si

Uvod: Znano je, da je kronična bolečina v ledveni hrbtenici prizadene v svetu do 80 odstotkov odrasle populacije (1). Začetki preventivnih edukacijskih programov, kot je Šola proti bolečini v hrbtenici (ŠPBH) segajo v leto 1958 (2). Program ŠPBH je zanimiv in obetaven v terapiji pri bolnikih z bolečino v ledveni hrbtenici (3). Na URI – Soča poteka ŠPBH od leta 1990. Vsebina ŠPBH traja štiri ure in seznanja bolnike z zgradbo hrbtenice, pravilno držo, biomehaniko hrbtenice pri gibanju in različnih položajih, s terapevtskimi vajami in tehnikami dvigovanja bremen ter motiviranjem za telesne dejavnost. Namen raziskave je bil ugotoviti učinkovitost razumevanja edukacijskega programa pri bolnikih. **Metode:** V raziskavi so sodelovali vsi bolniki, ki so bili vključeni v ŠPBH od septembra do novembra 2009, in sicer 42 bolnikov, od tega 29 žensk in 13 moških. Na začetku in na koncu ŠPBH so izpolnili vprašalnik. Vprašalnik je bil sestavljen iz splošnega in strokovnega dela. Strokovna vprašanja so bila iz vsebine programa ŠPBH. Za analizo je bila uporabljena opisna statistika, McNemarov in parni t-test. **Rezultati:** Udeleženci so bili stari od 29 do 79 let; 21 zaposlenih, 7 nezaposlenih in 14 upokojujencev. Izobrazba je bila: 10 % osnovna šola, 60 % srednja, 29 % visoka in 2 % podiplomska. Razlog napotitve je bil v 90 % bolečina v ledvenem delu, pri preostalih bolečina v vratni ali prsni hrbtenici. Aktivnosti, s katerimi so se ukvarjali: hoja (24 bolnikov), kolesarjenje (6 bolnikov), plavanje (3 bolniki), vaje (3 bolniki), fitnes (1 bolnik), joga (1 bolnik), namizni tenis (1 bolnik) in tek (1 bolnik). Aktivni so bili od 2- do 12-krat na teden. Na vprašanje, koliko vretenc je v ledvenem delu, je na začetku pravilno odgovorilo 22, na koncu pa 34 bolnikov. Na kaj moramo paziti pri sedenju, je na začetku pravilno odgovorilo 38, na koncu 42 bolnikov. O pravilnem pobiranju predmetov s tal je na začetku pravilno odgovorilo 40, na koncu 42 bolnikov. Kakšno naj bi bilo ležišče, je na začetku pravilno odgovorilo 34, na koncu 41 bolnikov. Kako si lahko izboljšamo delovno okolje, je na začetku pravilno odgovorilo 39, na koncu 42 bolnikov. V strokovnem delu vprašalnika se je delež pravilnih odgovorov statistično izboljšal ($p < 0,05$ McNemarov test). Skupna ocena vprašalnika se je tudi statistično izboljšala (maksimum 12, povprečje 6,4 na začetku, 8,3 na koncu, $p < 0,001$ parni t-test). Z oceno zadovoljstva s ŠPBH je 88 % udeležencev odgovorilo, da je dobilo ustrezne napotke za nadaljnje življenje, 12 % deloma. **Zaključki:** Rezultati vprašalnika so pokazali, da je bil program ŠPBH učinkovit pri razumevanju edukacijskega programa za bolnike z bolečino v hrbtenici.

Ključne besede: edukacija, kronična bolečina, ledvena hrbtenica, terapevtske vaje, vprašalnik.

Effectiveness of the back school educational program

Background: It is known that low back pain affects up to 80% of the adult population worldwide (1). Back School education dates back to 1958 (2). Back School education is an interesting and promising program to treat patients with low back pain (3). Back School education was started at URI – Soča in 1990. It familiarises the patients with spine anatomy, correct posture, spine biomechanics during movement and in various positions, therapeutic exercise, load-lifting techniques, and motivation for activities. The aim of this study was to assess the effectiveness of understanding our program. **Methods:** All the patients that attended the Back School education at URI – Soča in September and November 2009 took part in this study: 42 patients, of these 29 women and 13 men. They filled in a questionnaire at the beginning and end of the program. The questionnaire consisted of a general and specialised part. The specialised questions were based on the content of the Back School. Data were analysed using descriptive statistics, McNemar test and paired t-test. **Results:** Patients were 29 to 79 years old; 21 were employed, 7 unemployed and 14 retired. Education was 10% elementary school, 60% high school, and 30% university. 90% of the patients attended the program due to low-back pain, 10% due to cervical and thoracic back pain. Activities were: walking (n = 24), cycling (n = 6), swimming (n = 3), general exercise (n = 3), and fitness (n = 1), yoga (n = 1), running (n = 1) and table tennis (n = 1); active 2 to 12 times per week. With respect to the specialised questions, the number of lumbar vertebrae was known by 22 patients at the beginning vs. 34 at the end; correct sitting position was known by 38 at the beginning vs. 42 at the end; correct way of picking up objects by 40 at the beginning vs. 42 at the end; characteristics of a suitable bed by 34 at the beginning vs. 41 at the end; workplace improvement by 39 at the beginning vs. 42 at the end. In all the specialised questions the proportion of correct answers improved and was statistically significant (McNemar test: $p < 0.05$). The total score also improved and was statistically significant (maximum 12, mean 6.4 at the beginning vs. 8.3 at the end, paired t-test: $p < 0.001$). 88% of the patients stated that they received useful guidance for the future, while 12% received only some. **Conclusions:** The study showed the Back School education program to be effective.

Keywords: education, chronic pain, low back, therapeutic exercise, questionnaire.

Literatura/References

1. Andersson GBJ (1999). Epidemiological features of chronic low-back pain. *Lancet* 354: 581–5.
2. White AH (1983). *Back School and Other Conservative Approaches to Low Back Pain*. St. Louis: The C. V. Mosby Company, 43–7.
3. Forssell MZ (1980). The Swedish Back School. *Physiotherapy* 66: 112–4.

Effects of a single postero-anterior mobilization on the lumbar flexion range of motion

Miriam Friede, PT

Carinthia University of Applied Sciences, Klagenfurt, Austria

Correspondence: Miriam Friede; e-mail: m.friede@fh-kaernten.at

Background: The technique of Maitland's postero-anterior (PA) mobilisation is often used to treat pain and restricted movement of the peripheral joints and the spine. In spite of its widespread use in clinical practice, previous research examining the efficacy of this technique failed to detect significant changes in lumbar flexibility after pa mobilization (1, 2, 3). As in all of these studies, the mobilization programs were performed with the subjects lying in prone position, it is plausible to assume that insufficient elongation was applied to anatomical structures to induce significant therapeutic effects. The aim of this study was to reveal possible changes in flexion range of motion (ROM) of the lumbar spine after a single session of pa mobilization in end-of-range (EOR) position. **Methods:** A same-subject, repeated-measures, crossover design was used to study 25 asymptomatic subjects (19 female and 6 male). All participants were scheduled for three visits, interspersed by a minimum of one week. The following treatments were applied in a randomised order: (a) pa mobilization of the lumbar spine in EOR position (one minute pa mobilization on the first, second and third lumbar vertebra of Grade III as described by Maitland); (b) kneeling on an examination bed with the lumbar spine flexed for a period of three minutes; (c) passive lying in prone position as control condition, also for a period of three minutes. Before and after each intervention the mobility of lumbar flexion was measured using the MediMouse[®] system, to detect possible changes in the pain freeROM. **Results:** No significant differences in flexion ROM were observed after application of different treatments. However, the effects of the mobilization program were found to differ significantly in dependency of the subjects' initial mobility ($p = 0.0013$). Participants with initial flexion ROM $\leq 31^\circ$ (= median) increased their ROM following mobilization slightly ($M = 0.8$; $SE = 0.5$), whereas participants with initial flexion ROM $> 31^\circ$ showed a decreased ROM following mobilization ($M = -1.6$; $SE = 0.5$). **Conclusions:** In our sample, mobilization had no significant effect on flexion ROM but treatment effects seem to depend on the subjects' pre-intervention mobility status. Subsequent studies investigating the effects of EOR mobilization should concentrate on subjects whose spinal mobility is restricted.

Keywords: lumbar mobility, spine, Maitland, end of range, Medimouse.

Acknowledgement: There was no funding support for this research project.

References

1. Mc Collam R, Benson C (1993). Effects of postero-anterior Mobilization on Lumbar Extension and Flexion. *J Manual ManipulativeTher* 1(4): 134–41.
2. Goodsell M, Lee M, Latimer J (2000). Short-term effects of lumbar postero-anterior mobilisation in individuals with low-back pain. *J Manipulative PhysiolTher*23(5): 332–42.
3. Stamos-Papastamos N, Petty N, Williams J (2011). Changes in bending stiffness and lumbar spine range of movement following lumbar mobilization and manipulation. *J Manipulative PhysiolTher*, 34(1): 46–53.

Assessment and treatment of an adult after stroke with the Bobath concept – a case report

Andelka Knezović Svetec, bacc. physioth., thera. occup.

Private practice physical therapy, Dugo Selo, Croatia

Correspondence: Andelka Knezović Svetec, e-mail: fizikalnaterapija.ds@gmail.com

Background: The Bobath Concept is a problem solving neurodevelopmental approach for the assessment and treatment of patients with disturbances of function, movement and postural control due to a lesion of the central nervous system. The rationale for current practice is based upon present scientific facts of motor control, motor learning and neural plasticity, as well as on science of biomechanics. The International Classification of Function (ICF) (WHO 2001) provides a basis for assessment of the patient's ability to perform functional activities and participate in life situations, and for analysing the underlying impairments which may result in dysfunction. The aim of the assessment of a patient diagnosed with tetraparesis spastica pps. relapse and ICV syndrome extrapyramidal ataxia, Pusher syndrome was to identify and analyse problems with functional activities and participation in daily life situations, as well as to analyse movement components and underlying impairments. Treatment strategies addressed underlying impairments, task-specific components of posture and movement, the functional activity and its integration into participation in relevant situations in daily life of the patient. Cognitive, emotional and behavioural factors were also addressed in order to enable him to engage in task-related problem solving. The purpose of this case study was to gather information on the immediate and short-term effects of Bobath intervention strategies and techniques including therapeutic handling, facilitation, inhibition and key points of control. **Methods:** The neurophysiotherapist tried to optimise postural and movement strategies in order to re-establish effective task performance of the patient. Specific handling techniques and facilitation of normal movement patterns were amongst the many strategies used to achieve functional goals, and were modified and withdrawn consequently. The task and the environment were structured to facilitate successful performance by directing the patient's attention to the task and awareness of it as well as by reducing the physical demands of the task. Effective intervention involved a total management strategy 24 hours per day, and preventative and promotive measures have been included by the assessment of activities of everyday life. All of the tests ("Stand up and sit down", "Stand up and go", FIM test and Berg balance scale) were chosen because of their reliability, validity, and relevance to neurodevelopmental treatment research. **Results:** The case study showed significant improvements in sensorimotor control of the lower and upper extremity of the patient, balance control assessed with the Berg Balance Scale. **Conclusion:** The Bobath treatment should be based on up-to-date knowledge of evidence-based strategies as well as on knowledge of the time-dependent nature of recovery patterns. All Bobath therapists should be open-minded to evidence-based practice and receptive to new developments in neurodevelopmental rehabilitation.

Keywords: Bobath concept, facilitation, tetraparesis, assessment.

References

1. Bente E, Basso G (2008). The Bobath Concept in Adult Neurology. Stuttgart: Georg Thieme Verlag.
2. Matković B, Ruzic L (2009). Fiziologija sporta i vežbanja. Zagreb, Kineziološki fakultet Sveučilišta u Zagrebu.
3. Čovčić G, Macek Z (2011). Neurofacilitacijska terapija. Zagreb: Medical College.
4. Dizdarevic A (2012) Script-Bobath basic course, Zagreb.
5. Bakran Z (2007). Rehabilitation of persons with hearing functions of the cerebellum. Zagreb: Newsletter of the head up.
6. Poeck K (2000). Neurologija. Zagreb: Školska knjiga.

Naprava za korekcijo everzije stopala med hojo pri pacientki po možganski kapi »nogomer« – poročilo o primeru

Katja Logar, dipl. fiziot.

Dom Starejših občanov Preddvor

Korespondenca/Correspondence: Katja Logar; e-pošta: katjalog@gmail.com

Uvod: Leto 2012 je bilo evropsko leto aktivnega staranja in solidarnosti med generacijami (1). Medgeneracijsko sodelovanje je potekalo tudi med Domom starejših občanov Preddvor in Osnovno šolo Predoslje. Ekipa [ne:]PREDvidljivi z Osnovne šole Predoslje sodeluje na tekmovanju *First lego league* in njihov izziv je bil najti rešitve za starejše ter kako staranje vpliva na sposobnost starajoče osebe v smislu ohranjanja življenjskega sloga (2). Rešitve so začeli iskati v Domu starejših občanov Preddvor, kjer so se srečali s stanovalko doma in s fizioterapevtko. Namen raziskave je bil ugotoviti uporabnost rešitve izziva iz tekmovanja *First Lego League* v fizioterapevtski obravnavi starostnika. **Metode:** Ekipa [ne:]PREDvidljivi z Osnovne šole Predoslje so imeli na prvem srečanju intervju s stanovalko Doma starejših občanov Preddvor. Med pogovorom so odkrivali težave, s katerimi se srečuje gospa v vsakdanjem življenju. Stanovalka je stara 69 let, pred 7 leti je imela možgansko kap s posledično desnostransko hemiplegijo. Desni zgornji ud je povsem plegičen, desni spodnji ud pa paretičen. Sposobna je hoje z berglo na krajše razdalje. Ima peronealno opornico in individualno izdelano obutev. Pri hoji ne izvede popolnega prenosa teže na desno nogo, prenos teže izvede hitro, pri dostopu na peto se stopalo obrne v izrazito everzijo (45°). Ob fizioterapevtovem vodenju je sposobna korigirati prenos teže na desno, s čimer je dostop boljši, v stopalu pa je everzija manjša. Zasuk noge v everzijo je gospa navedla kot težavo, ki je predstavljal izziv za ekipo [ne:]PREDvidljivi. Izdelali so napravo za korekcijo hoje in jo poimenovali nogomer. Sestavili so jo iz Lego kock Mindstorms in dveh žiroskopskih senzorjev, ki merita kot med stopaloma. Kadar je kot med levo in desno nogo prevelik, naprava s piskanjem in lučko opozori na nepravilen položaj stopala. Za ugotavljanje učinkovitosti sta bila pred namestitvijo naprave in po njej merjena število korakov in čas za prehojeno razdaljo na 20-metrski stezi (6 ponovitev). **Rezultati:** Položaj stopala je bil po nekajkratnih poskusih boljši, sposobna je bila prehoditi daljšo razdaljo brez stalnega piskanja. Pacientka je na prehojeni razdalji 20m naredila povprečno 33 korakov, v povprečno 1,26 minute. Povprečna kadenca je bila 23 korakov/minuto. Ob vodenju terapevta (brez naprave) je naredila 13 korakov brez izrazite everzije v stopalu, 15 korakov pa pri uporabi naprave. Brez vodenja terapevta in brez naprave (spontana hoja) je naredila le 7 korakov brez povečane everzije na 20-metrski stezi. **Zaključki:** Nogomer se je izkazal kot uporabna naprava v fizioterapiji, saj jo lahko uporabimo kot pomoč za korekcijo gibanja (»tretja roka«), hkrati pa deluje na pacienta motivacijsko. Za natančnejšo uporabo bi bilo treba narediti dodatne tehnične izboljšave in raziskave, ki bi potrdile njeno uporabnost in zanesljivost.

Ključne besede: medgeneracijsko sodelovanje, kap, fizioterapija pri starostnikih.

A device to correct foot eversion in walking after stroke "Foot-meter" – a case report

Background: The year 2012 was the European Year of active ageing and solidarity between generations (1). Intergenerational cooperation took place also between the Elementary school Predoslje and Home for elderly parishioners Preddvor. The Team [ne:]PREDvidljivi - nonpredictable from the Elementary school Predoslje participates in the competition First Lego League (FLL) and their challenge was searching for the solution for the elderly, and how ageing affects the ability of ageing people in terms of maintaining their lifestyle (2). They have started to search for solutions in the Home for elderly parishioners Preddvor, where they met with one of the residents of the Home and her physiotherapist. The purpose of the research was to present the intergenerational cooperation and estimate usability of the solution of the challenge from the competition FLL in therapy. **Methods:** The Team Nonpredictable from primary school Predoslje and the resident of HEP Preddvor had the interview at their first meeting in terms of detection of the problem of an old lady. She is 69 years old. 7 years ago she had the CVA which resulted in a right-sided hemiplegia. The right arm is completely paralysed and the leg is paretic. She is able to walk with a crutch at shorter distances. She uses the fibular brace and custom-made footwear. When walking she fails to make a complete transfer of weight to the right foot, she does it very quickly, first she steps on her heel, and her foot turns in strong eversion (45°). When she is controlled she is able to correct her weight transfer to the right which results in the better access and smaller foot eversion. The lady stated the rotation of her foot into eversion as a problem, which became a challenge for the Team Nonpredictable. **Results:** The Team Nonpredictable produced a device for the correction of a foot, and named it "foot-meter". From Lego mindstorms and 2 gyroscopic sensors they constructed the "foot-meter", which measures the angle between both feet. When the angle between the left and the right foot is too high the "foot-meter" notes the improper foot position with the light and beeping. The lady had installed the device while walking, and beeps at every step warned her if the position of her feet was too much in the eversion. The tolerance was 10 degrees. The position of her foot was better after several attempts, and she was able to walk at longer distances without constant beeping. In an average she made 33 steps at 20 m distance in approximately 1.26 minutes. Cadence was 23 steps/minute. With guiding by the physiotherapist she succeeded in making 13 steps without eversion of the foot, 15 steps with the use of a "foot-meter", and without any correction she was able to make only 7 steps without the eversion. **Conclusion:** The foot-meter is a useful instrument for the implementation of physiotherapy. It can be used as a third hand which at the same time influences also the patient's motivation. For a more detailed application it would be required to make some technical improvements, more tests and studies to confirm its usefulness and reliability.

Keywords: intergenerational cooperation, stroke, physiotherapy for geriatric patients.

Literatura/References

1. JanezPlatiše(2012).Naslovhttp://www.seniorji.si/MEDGENERACIJSKO_evropsko_letno_aktivnega_staranja_in_medgeneracijske-solidarnosti. (27. 2. 2013)
2. Zavod super glavce (2013). Naslov <http://www.fll.si/izziv-2012/splosno-o-izzivu-2012>. <15. 1. 2013>.