

Pet-dnevni intenzivni program za obravnavo pacientov z adolescentno idiopatsko skoliozo na Univerzitetnem rehabilitacijskem inštitutu URI - Soča Ljubljana

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Uvod: Adolescentna idiopatska skolioza (AIS) je tridimenzionalna deformacija hrbtenice in trupa, ki se pojavi pri zdravih otrocih v puberteti. Aktivna samopoprava drže in vaje, usmerjene v izvedbo določene naloge, pri pacientih z manjšo skoliozo bolj vplivajo na zmanjšanje deformacije hrbtenice kot tradicionalne vaje za hrbtenico (1). Namen prispevka je ovrednotiti petdnevni intenzivni program za obravnavo AIS, ki smo ga poskusno izvedli na URI - Soča, in ga primerjati z izvajanjem vaj v aktivni samopopravi drže doma, v enotedenskem obdobju. **Metode:** V pilotski raziskavi, ki smo jo opravili leta 2018, smo program izvedli dvakrat. Petdnevni program je vsak dan vključeval 45-minutno fizioterapevtsko obravnavo po znanstveno vadbenem pristopu k skoliozi (Scientific Exercise Approach to Scoliosis - SEAS) (2), 45-minutno hidroterapijo, 60-minut delovne terapije, 60-minut športne aktivnosti in 30-minutno funkcionalno vadbo. V priložnostni vzorec so bili vključeni pacienti z AIS, ki so bili že obravnavani v ambulantno-rehabilitacijski službi (ARS) na URI - Soča in so vsi že imeli petkrat individualno fizioterapevtsko obravnavo po pristopu SEAS ter petkrat vodene vaje v manjši skupini. Pacienti v testni skupini so imeli pred začetkom intenzivnega programa eno uro edukacije o skoliozi. Pacienti v kontrolni skupini so imeli dve fizioterapevtski obravnavi po pristopu SEAS po 45 minut, enkrat na teden, z navodili, da doma vaje izvajajo vsak dan. Pri vseh pacientih smo prvi in zadnji dan obravnave naredili funkcionalno oceno (3), ki je vključevala Rombergov test stoje na eni nogi z odprtimi in zaprtimi očmi, test Fukuda, modificiran klinični test senzorične integracije in ravnotežja (Clinical Test of Sensory Integration and Balance – mCTSIB) na aparaturi Biodex System SD (4) ter oceno estetskega videza trupa z lestvico TRACE (Trunk Aesthetic Clinical Evaluation) (5). V programu Scoliosis Manager smo pripravili program vaj za individualno obravnavo. Analiza podatkov je bila narejena s programom SPSS. **Rezultati:** V testno skupino je bilo vključenih šest pacientk, starih povprečno 12,8 (SD 2,0) leta. Povprečna velikost glavne krivine je bila 20,2° po Cobbu. Ortozo je nosilo pet pacientk, v povprečju 16,2 (SD 5,2) ure na dan. V kontrolno skupino je bilo vključenih šest pacientov (pet deklet in en fant), starih povprečno 14,2 (SD 2,1) leta. Povprečna velikost glavne krivine je bila 29,6° po Cobbu. Ortozo sta nosila dva pacienta, v povprečju 15,5 (SD 0,7) ure na dan. V testni skupini je prišlo do sprememb, ki pa niso statistično značilne ($p < 0,05$), v testih: Fukuda vertikalno ($p = 0,188$), Rombergov test stoje na levi nogi z odprtimi očmi ($p = 0,188$), zaprtimi očmi ($p = 0,148$), mCTSIB ($p = 0,250-0,798$), TRACE se je izboljšal za 0,33 točke na 5,7 (SD 1,6) ($p = 0,178$). V kontrolni skupini je prišlo do izboljšanja pri Rombergovem testu stoje na levi nogi z zaprtimi očmi za 5,8 s, kar ni statistično značilno ($p = 0,82$). TRACE je ostal enak 6,2 (SD 2,3). **Zaključki:** Petdnevni intenzivni program je bolj vplival na spremembe v ravnotežju in estetskem videzu trupa kot samostojno izvajanje vaj doma.

Ključne besede: AIS, posebne fizioterapevtske vaje za skoliozo, aktivna samopoprava drže, vaje, usmerjene v nalogo, SEAS

Five-day intensive scoliosis specific exercise programme for patients with Adolescent Idiopathic Scoliosis at the University Rehabilitation Institute URI - Soča Ljubljana

Background: Adolescent idiopathic scoliosis (AIS) has been defined as a three-dimensional deformity of the spine and trunk occurring in healthy pubertal children. The programme of active self-correction and task-oriented exercises is superior to traditional exercises in reducing spinal deformities in patients with mild AIS (1). The objective is to evaluate experimentally performed five-day intensive scoliosis specific exercise programme for patients with AIS at the University Rehabilitation Institute URI - Soča Ljubljana and to compare it with performing exercises in active self-correction at home in one week period. **Methods:** In the pilot study we carried out in 2018 two intensive programs were arranged. A five-day program each day included: 45 minutes of physiotherapy treatment according to SEAS approach (2), 45 minutes of hydrotherapy, 60 minutes of occupational therapy, 60 minutes of sport activity and 30 minutes of task-oriented exercises. In a convenience sample patients with AIS were included which were already treated in an outpatient department at URI - Soča. They all had five individual physiotherapy treatments according to SEAS approach and exercises in a small group five times. Before the start of intensive program patients in the study group had one hour of education about scoliosis. Patients in the control group had two 45-minute physiotherapy treatments according to SEAS approach, once a week with instructions to perform exercises at home every day. On the first and the last day, all patients had functional examination (3) which included: Romberg test on one leg with open and closed eyes; modified Clinical Test of Sensory Integration and Balance (mCTSIB) using Biodex System SD (4) and Trunk Aesthetic Clinical Evaluation (TRACE) (5). An exercise plan for individual sessions using Scoliosis Manger was made. Data were analysed using SPSS. **Results:** There were 6 patients in the study group, mean age 12.8 (SD 2.0). Mean Cobb angle of the major curve was 20.2°. Cheneau-Rigo brace had five patients, mean time of wearing it was 16.2 (SD 5.2) hours per day. There were 6 patients in the control group (5 girls, 1 boy), mean age 14.2 (SD 2.1). Mean Cobb angle of the major curve was 29.6°. Cheneau-Rigo brace had 2 patients, mean time of wearing it was 5.5 (SD 0.7) hours per day. In the study group there were some changes but not statistically significant ($p < 0.05$) in Fukuda vertical test ($p = 0.188$), Romberg test on left leg with open eyes ($p = 0.188$), closed eyes ($p = 0.148$), mCTSIB ($p = 0.250$ to 0.798), TRACE improved for 0.33 points on 5.7 (SD 1.6) ($p = 0.178$). In the control group there was an improvement in Romberg test on left leg with closed eyes, for 5.8 s, which was not statistically significant ($p = 0.82$). TRACE remained the same 6.2 (SD 2.3). **Conclusions:** Five-day intensive program for AIS influenced the changes in balance and aesthetics compared to home exercise compliance.

Key words: AIS; physiotherapeutic scoliosis-specific exercises, active self-correction, task-oriented exercises, SEAS

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Dolgotrajno prekinjajoče se sklanjanje poveča refleksne odzive mišic trupa in togost trupa

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Uvod: Vse več dokazov iz raziskav na ljudeh in živalih kaže negativne učinke ponavljajočega se in vzdrževanega sklanjanja na pasivne strukture trupa ter uravnavanje gibanja (1). Še zmeraj je primanjkljaj študij, ki hkrati proučujejo mehanske učinke sklanjanja in učinke na senzorično-motorično uravnavanje. Namen naše raziskave je proučiti učinke 60-minutnega prekinjajočega se sklanjanja na stabilnost trupa in preveriti morebiten pozitiven učinek uporabe pasivne podpore za zgornji del trupa med sklanjanjem. Rezultati te študije so bili že objavljeni (2). **Metode:** V študijo je bilo vključenih 21 prostovoljcev (11 moških, starih $23,2 \pm 2,0$ leti; 10 žensk, starih $24,3 \pm 4,0$ leta). Študijo je odobrila etična komisija Fakultete za znanosti o gibanju človeka Univerze VU Amsterdam. Vsi preiskovanci so sodelovali prostovoljno in so podpisali izjavo o svobodni privolitvi. Preiskovanci so bili v dveh ločenih obiskih izpostavljeni dvema pogojema: podprtemu in nepodprtemu sklanjanju v sedečem položaju s pokrčenimi koleno. Vsak pogoj je vključeval 40 ciklov po 1 minuto 80-odstotnega največjega upogiba ledvene hrbtenice in 30 s vzravnane sedenja. Med podprtim sklanjanjem so bili preiskovanci s prsnim košem in rameni naslonjeni na oblazinjeno podporo ustrezne višine. Z uporabo inovativne in ponovljive metode smo pred izpostavljenostjo posameznemu pogoju in po njej z merjenjem sil med dinamičnimi motnjami izmerili podajnost trupa. S hkratno uporabo elektromiografije (REFA, TMSi, Netherlands) smo izmerili refleksne odzive mišic trupa in spremembe ravni mišične aktivacije. Z uporabo inercialnih senzorjev (Xsens Technologies X-bus, Enschede, Netherlands) smo izmerili tudi spremembe v obsegu gibljivosti v smeri upogiba trupa. Podatke smo analizirali z uporabo analize variance za ponovljene meritve. **Rezultati:** Obseg gibljivosti v smeri upogiba ledvene hrbtenice se je povečal po obeh pogojih pri ženskah, toda le po nepodprtem sklanjanju pri moških preiskovancih ($p = 0,044$, $\eta^2 = 0,20$). V nekaterih frekvencah je bilo opaziti obsežnejše zmanjšanje podajnosti trupa po nepodprtem v primerjavi s podprtim sklanjanjem ($p = 0,039$, $\eta^2 = 0,13$). Prekinjajoče se sklanjanje je povzročilo povečanje refleksnih odzivov. Značilen interakcijski učinek kaže večje povečanje refleksnih odzivov po nepodprtem v primerjavi s podprtim sklanjanjem ($p = 0,025$, $\eta^2 = 0,14$). **Zaključki:** Spremembe v podajnosti trupa so v nasprotju s predhodnimi študijami, v katerih so proučevali krajša obdobja sklanjanja, kar podpira hipotezo, da so spremembe odvisne od trajanja sklanjanja (3). Trajanje obdobja obremenitev spodnjega dela hrbta bi bilo torej treba upoštevati pri ocenjevanju kumulativnih obremenitev hrbta. Učinki sklanjanja so bili podobni, vendar značilno manjši ob uporabi pasivne podpore za zgornji del trupa med sklanjanjem. Na tej podlagi bi bilo smiselno priporočiti pasivno podporo med delovnimi nalogami, ki zahtevajo daljša sklanjanja trupa.

Ključne besede: senzorično-motorično upravljanje, stabilnost trupa, perturbacije trupa, pasivna podpora za trup

Prolonged intermittent trunk flexion increases trunk muscles reflex gains and trunk stiffness

Background There is a growing body of evidence from animal and human research indicating unfavourable effects of repeated and sustained flexion of the trunk on passive structures and on motor control (1). However, simultaneous investigations of mechanical and neuromuscular control changes following trunk flexion are scarce. The aim of this study was to assess the effect of a 60-minute intermittent trunk flexion. Additionally, the goal was to assess the potential beneficial effects of a passive support of the upper body in the flexed posture. The results of this study were already published (2). **Methods** Twenty-one young volunteers were included in the present study (11 males age 23.2 ± 2.0 years and 10 females, age 24.3 ± 4.0 years). The ethical committee of the Faculty of Human Movement Sciences of the VU University Amsterdam had approved the study protocol and all subjects signed an informed consent statement prior to the experiment. Participants were invited for two visits with two different exposure conditions: supported and unsupported flexion. During each condition participants performed 40 cycles of intermittent flexion (1 minute in 80 % of maximal lumbar flexion followed by 30-second upright sitting). In supported condition participants leaned on the padded support with their chests and shoulders. Before and after exposure to each condition innovative and reliable method was used to assess trunk admittance using force sensors and reflex gains using electromyography (REFA, TMSi, Netherlands) during small-amplitude trunk perturbations. Furthermore, changes in muscle activation and lumbar flexion range of motion were analysed (Xsens Technologies X-bus, Enschede, Netherlands). RMANOVA was used to check for potential differences. **Results** Maximal flexion range of motion increased following both conditions in female subjects but only following unsupported condition in male participants ($p = 0.044$, $\eta^2 = 0.20$). Stronger reduction of admittance gain was shown after unsupported than after supported flexion at certain frequencies ($p = 0.039$, $\eta^2 = 0.13$). Intermittent trunk flexion resulted in increased reflex gains with reflex gains also overall being higher in the unsupported condition. A significant interaction effect indicated a stronger increase in reflex gain after unsupported flexion at all analysed frequencies but the lowest ($p = 0.025$, $\eta^2 = 0.14$). **Conclusions** The change in admittance is in contrast with results of previous studies that used shorter lasting interventions, therefore supporting the idea of a time-varying response to lumbar viscoelastic deformation (3). Therefore, the duration of the spinal loading should be considered when assessing cumulative low back loading and its effects. The effects of trunk flexion were similar but significantly smaller when external passive support for the upper body was used. For this reason, the use of upper body support would be recommended in occupational settings requiring flexed postures.

Key words: neuro-muscular control, trunk stability, trunk perturbations, passive upper body support

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Pojavnost mišično-kostnih okvar pri glasbenikih in glasbenicah – pregled literature

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Uvod: Mišično-kostne okvare, na katere vpliva oziroma jih povzroča igranje inštrumenta, imenujemo z igranjem povezane mišično-kostne okvare. Zaradi delovnega okolja in prisilne telesne drže, ki jo morajo poklicni glasbeniki vsak dan zadrževati tudi več ur, so mišično-kostne okvare pogost pojav (1, 4, 5). Povzročajo lahko bolečine, nezmožnost opravljanja dela na najvišji ravni in celo prenehanje dela (2, 3). Namen prispevka je pregledati objavljene rezultate raziskav o pojavnosti in dejavnih tveganja za mišično-kostne okvare med glasbeniki in glasbenicami ter načine za njihovo preprečevanje. **Metode:** V pregled literature so bila vključena prosto dostopna polna besedila raziskav o pojavnosti in dejavnih tveganja za mišično-kostne okvare med poklicnimi glasbeniki simfoničnih orkestrrov, objavljena od leta 2000. Literaturo smo iskali v podatkovnih zbirkah PubMed, CINAHL, PEDro. Uporabljene ključne besede so bile musculoskeletal disease AND musician, musician AND risk factor AND musculoskeletal problems. **Rezultati:** Iskanje literature je dalo 494 zadetkov, 6 od teh je bilo vključenih v analizo. Vse raziskave so bile pregledne presečne. Pojavljale so se razlike v definiciji z igranjem povezanih mišično-kostnih okvar, merilnih orodjih, časovnem okviru pojavnosti in podajanju podatkov o izidih raziskav. V raziskavah je sodelovalo 1645 preiskovancev. Pojavnost okvar med glasbeniki v zadnjem letu je bila od 83- do 97-odstotna, kadarkoli v življenju pa od 84- do 89,5-odstotna. Najpogosteje prizadeti predeli so bili vrat, ramena, zgornji del hrbta in križ. Med ženskami in godalci so se pogosteje pojavljale mišično-kostne okvare. Drugi dejavniki tveganja so bili biomehanski dejavniki (ekstremna telesna drža, pretirana mišična aktivacija, ponavljajoči se gibi, statično in dinamično breme), zaznano fizično okolje (glasnost zvoka, temperatura, vlažnost, prezračenost in osvetljenost koncertnih prostorov ter prostorov za vadbo), veliko ur igranja na inštrument, težnja po somatiziranju, trema pred nastopanjem in depresija. **Zaključki:** Z igranjem povezane mišično-kostne okvare imajo med glasbeniki visoko pojavnost. Zaradi strahu, da bi izgubili spoštovanje kolegov in delovno mesto, jih prizadeti pogosto zamolčijo. Potrebne so dodatne visokokakovostne raziskave, v katerih bi vsi avtorji uporabili enako definicijo z igranjem povezanih mišično-kostnih okvar in enaka standardizirana merilna orodja.

Ključne besede: mišično-kostne okvare, bolečina, poklicni glasbeniki, dejavniki tveganja, pojavnost

Incidence of musculoskeletal disorders in musicians – literature review

Background: Musculoskeletal disorders that are affected or caused by playing an instrument are addressed as playing-related musculoskeletal disorders. Musculoskeletal disorders are common phenomenon among musicians due to their working environment and forced body postures they have to retain every day for up to several hours. They can cause pain, inability to perform on maximum level and even termination of work. The aim of the article was to review published results of studies that investigated incidence and risk factors for musculoskeletal disorders among musicians and to determine ways of preventing them. **Methods:** Studies investigating incidence and risk factors for musculoskeletal disorders among professional musicians employed in symphonic orchestra which were published from year 2000 onwards and with access to full text were included in this review. Literature was searched in databases PubMed, CINAHL and PEDro. Keywords used in literature search were musculoskeletal disease AND musician, musician AND risk factor AND musculoskeletal problems. **Results:** The initial literature search strategy resulted in 494 hits, six of which were included in analysis. All studies were cross-sectional. Differences in definitions of playing-related musculoskeletal disorders, measuring tools, time frame of incidence and presentation of results were present in studies. Total number of participants included in all studies was 1645. Year prevalence of disorders among musicians ranged between 83–97 % and life prevalence ranged between 84–89,5 %. Most common pain regions were neck, shoulders, upper back and lower back. Women and string players had higher incidence of musculoskeletal disorders. Other risk factors were biomechanical factors (extreme body postures, excessive muscle activation, repetitive movements, static and dynamic loading), perceived physical environment (sound intensity, temperature, humidity, ventilation and illumination in the concert and rehearsal halls), many playing hours, somatizing tendency, performance anxiety and depression. **Conclusions:** Playing-related musculoskeletal disorders have high prevalence among musicians. They often conceal them, fearing that they might lose the appraisal of their colleagues and their job. There is need for more high quality studies in which all authors would use the same definition of playing-related musculoskeletal disorders and same measuring tools.

Key words: musculoskeletal disorders, pain, professional musicians, risk factors, incidence

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Vpliv elastičnih lepilnih trakov na izboljšanje prekrvavitve preostalega uda pri bolnikih po amputaciji spodnjega uda zaradi žilnega vzroka

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Uvod: Večina bolnikov po amputaciji noge ima zaradi periferne arterijske bolezni (PAB) večje ali manjše spremembe ožilja tudi na preostalem udu (1). Pri kroničnih okvarah s klavdikacijsko bolečino je poleg zdravljenja z zdravili priporočena intervalna vadba, ki pa je pri bolnikih po amputaciji zaradi omejene možnosti gibanja neizvedljiva, zato se v tem obdobju uporabljajo različne druge metode fizikalne terapije, na primer elektrostimulacija, vakuumska terapija, intermitentna kompresija, hiperbarična terapija idr. (2). Pri uporabi elastičnih lepilnih trakov so ugotovili takojšnje ugodne učinke na bolečino in gibljivost sklepov, zmanjšanje edema in v nekaterih pilotnih študijah tudi povečanje pretoka na ravni mikrocirkulacije pri zdravih preiskovancev (3, 4). Namen raziskave je bil ugotoviti kratkoročen vpliv elastičnih lepilnih trakov na izboljšanje prekrvitve preostalega uda pri bolnikih po amputaciji vzroka. **Metode:** Do zdaj je bilo v pilotno raziskavo vključenih osem bolnikov, ki so bili naključno razvrščeni v dve skupini. Pacienti v testni skupini so imeli poleg rednih fizioterapevtskih programov elastični lepilni trak nameščen čez podkolensko jamo na dvoglavo mečno mišico in skupino upogibalk kolena. Uporabili smo tehniko za razbremenjevanje. Izvedene meritve pred vključitvijo so bile skozižilna oksimerija na standardnem mestu stopala, volumen spodnjega uda do kolena po protokolu za opredelitev limfedema, 6-minutni test hoje z določitvijo klavdikacijske razdalje in število možnih ponovitev dviga na prste in peto. Meritve smo ponovili po dveh in štirih tednih. Raziskavo je etična komisija URI - Soča odobrila 8. januarja 2018, številka 8/2018. **Rezultati:** Povprečna vrednost TcPO₂-10 min je znašala 21,00 mm Hg in TcPO₂-20 min 32,5 mm Hg. Povprečen volumen spodnjega uda do kolena je znašal 1566,76 cm³. Pri TcPO₂ in v volumnu spodnjega uda med prvim, drugim in tretjim ocenjevanjem ni bilo statistično značilnih razlik. Rezultati obeh funkcionalnih testov so se statistično značilno izboljšali od prvega do tretjega ocenjevanja; dvigovanje na prste (povprečje: 42,0; mediana: 29,5), 6-minutni test hoje (povprečje: 95 m; mediana: 45 m). Klavdikacijska bolečina je bila prisotna pri enem pacientu (prvo ocenjevanje – 20 m, drugo ocenjevanje – 27 m), ki pa je popolnoma izzvenela do tretjega ocenjevanja. **Zaključki:** V preostali nogi nismo dokazali klinično pomembnih sprememb v prostornini in tlakih. Za doseglo veljavnejših rezultatov je treba v raziskavo vključiti večje število pacientov. Kljub izboljšanju pri kliničnih testih ne moremo zaključiti, da je izboljšanje posledica uporabe elastičnih lepilnih trakov.

Ključne besede: prekrvavitve, PAB, elastični lepilni trak

Influence of elastic adhesive tapes on the improvement of blood circulation in the remaining limb in patients after lower limb amputation

Introduction: After lower-limb amputation most patients experience greater or minor changes in the vascular system in the remaining limb due to the peripheral arterial disease (PAD) (1). In addition to treatment with medication in chronic disorders with claudication pain, interval training is also recommended. However, this is not possible in patients who have recently undergone amputation, due to their limited mobility. Therefore, other physical therapy methods are used during this period, such as electrostimulation, vacuum therapy, intermittent compression therapy, hyperbaric therapy, etc. (2). The use of elastic adhesive tapes is beneficial in the reduction of pain and greater flexibility of joints, reduction of oedema, and some pilot studies have shown they increase the flow at the level of microcirculation in healthy subjects (3, 4). The purpose of the study is to determine the short term effects of elastic adhesive tapes on the improvement of blood circulation in the remaining limb in patients after lower limb amputation.

Methods: Eight patients were included. Subjects were randomly assigned in two groups. In the experimental group, the patients had, beside regularly prescribed physiotherapy, elastic adhesive tape applied over the popliteal fossa onto the m. gastrocnemius and a group of knee flexors. A disburdening technique was used. Measurements that were carried out prior to the inclusion in the study: transcutaneous oxygen measurement (TcPO₂), volume (V) of the calf in accordance with the lymphedema definition protocol, 6-minute walk test (6MWT) with the determination of claudication pain and number of repetitions of standing heel-raise. Measurements were repeated after two and four weeks. The study was approved by the URI - Soča Ethic Commission on the eighth of January 2018, number 8/2018. **Results:** The median value of TcPO₂-10min was 21.0 mmHg and of TcPO₂-20min was 32.5 mmHg. The volume of the lower limb below the knee was in average 1566.76 cm³. There were no statistically significant differences in TcPO₂ and in the volume of the lower limb below the knee in the first, second and third assessment. The results of both functional tests in the first and third tests improved significantly; standing heel-raise test (median: 29.5; 42.0), 6MWT (median: 45 m; 95 m). Claudication pain occurred in one patient (first assessment 20 m, second assessment 27 m), which completely diminished in the 3rd assessment.

Conclusion: No clinically significant changes in the volumes and pressures of the remaining lower limb were detected. Therefore, a bigger sample size should be included in the research to obtain more valid results. Despite improving in the functional tests, we can't firmly conclude that the results have improved with the elastic adhesive tape application.

Key words: blood circulation, PAD, elastic adhesive tape

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Učinki vadbe moči in vzdržljivosti inspiratornih dihalnih mišic na telesno zmogljivost pripadnikov Specialne enote Slovenske vojske

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Uvod: Namen raziskovalnega dela je bil ovrednotiti učinke vadbe dihalnih mišic s pripomočkom POWERbreathe pri pripadnikih Specialne enote SV. Namestitev bremena na prsni koš namreč omeji ekspanzijo prsnega koša, kar povečuje dihalno delo. Zaradi omejenega širjenja pljuč so dihalne mišice zunaj optimalnih meja svoje dolžinsko-napetostne krivulje. Taka sprememba v mehaniki dihanja pripelje do pospešene utrujenosti dihalnih mišic, kar lahko poslabša delovno zmogljivost posameznika, saj se zmanjša pretok krvi v drugih skeletnih mišicah in poveča zaznavanje napora (1). Raziskava Faghyja in Browna (2) je pokazala, da ta pojav lahko uspešno zmanjšamo s ciljano vadbo inspiratornih dihalnih mišic, vendar ni jasno, kakšen dihalni upor je potreben za optimalen učinek vadbe. **Metode:** Prostovoljce iz Enote za specialno delovanje SV smo z žrebom razdelili v dve skupini. Uvodno in končno testiranje je vključevalo antropometrične meritve, obremenilne teste za dihalne mišice, spirometrijo in test hoje s 25-kilogramskim nahrbtnikom na tekalni stezi. Eksperimentalna skupina je šest tednov vadila s pripomočkom POWERbreathe in z začetnim uporom 60 % MIP, ki smo ga postopno dvignili do 80 % MIP. Kontrolna skupina je vadila z enakim pripomočkom, a le z navideznim dihalnim uporom. Protokol vadbe je bil za obe skupini enak. Vadili so vsak dan v tednu, dvakrat na dan po 30 zaporednih maksimalnih vdihov z uporom, ki je bil prednastavljen na pripomočku. Obe skupini sta vodili dnevnik vadbe. Po končanem programu vadbe so preiskovanci opravili končno testiranje. Raziskavo je odobrila Komisija RS za medicinsko etiko, šifra odobritve 0120/494/2017. **Rezultati:** Izsledki raziskave so pokazali, da je prišlo do statistično pomembnih sprememb v času med skupinama v moči inspiratornih in ekspiratornih dihalnih mišic, kar pripisujemo učinku vadbe. Prav tako je prišlo do statistično pomembnih razlik v času med skupinama v utrujanju inspiratornih in ekspiratornih dihalnih mišic pred testom hoje in po njem. Ocenjena stopnja aerobne zmogljivosti, frekvenca srčnega utripa v mirovanju in med naporom, krvni tlak ter subjektivna ocena mišičnega in dihalnega napora po Borgovi lestvici se z vadbo niso pomembno spremenili. **Zaključki:** Vadba inspiratornih dihalnih mišic z ustreznim uporom izboljša mišično moč dihalnih mišic in zmanjša njihovo utrujanje. Ocenjujemo, da pomembnih razlik v merjenih spremenljivkah med testom hoje nismo zaznali zaradi nekoliko prenizke intenzivnosti uporabljenega testa, ki so ga vsi sodelujoči opravili brez večjega napora. Na podlagi rezultatov menimo, da je vadba inspiratornih dihalnih mišic smiselna za različne skupine telesno zahtevnih poklicev, na primer za terenske vojaške službe, gasilce, službe nujne medicinske pomoči ipd., kot tudi za posameznike, ki pri rekreativnih dejavnostih nosijo nahrbtnike, torej pohodnike, alpiniste, turne smučarje ipd.

Ključne besede: nošenje bremena, utrujanje inspiratornih dihalnih mišic, vadba inspiratornih dihalnih mišic, vojaki

Effects of strength training and endurance of inspiratory respiratory muscles on the physical performance of members of the Slovenian Armed Forces Special Unit

Background: The purpose of this research was to evaluate the effects of the IMT with the POWERbreathe device on the members of Slovenian Armed Forces Special Unit. The load mass carrying on the chest wall limits the chest expansion, which increases the work of breathing. Because of the limited lung movement, the respiratory muscles are beyond the optimal limits of their longitudinal-tension curve. Such change in respiratory mechanics leads to an accelerated fatigue of the respiratory muscles that can worsen the capacity of the individual, by reducing blood flow to other skeletal muscles and increasing the perception of effort (1). The research conducted by Faghy and Brown (2) showed that this phenomenon can be successfully reduced by targeted training of the inspiratory muscles, but it is not clear what is the optimal respiratory resistance for the optimal effect of exercise. **Methods:** The volunteers from the Slovenian Armed Forces Special Unit were divided into two groups by lot. Introductory and final testing included: anthropometric measurements, fatigue tests for respiratory muscles, spirometry, and a walk test with a 25-kg backpack on the treadmill. For six weeks, the experimental group trained with the POWER breathe device with an initial resistance of 60% MIP, which gradually increased to 80% MIP. The control group exercised with the same device, but with sham respiratory resistance. The training protocol was the same for both groups. They trained every day of the week, twice a day with 30 consecutive maximum breaths with resistance that was pre-set on the device. Both groups were keeping the exercise diary. After completion of the exercise program, the subjects completed the final testing. The research was approved by the Medical Ethics Commission of the Republic of Slovenia, approval code 0120/494/2017. **Results:** The results of the study showed that there were statistically significant changes in time between the groups in the power of the inspiratory and expiratory respiratory muscles, which is attributed to the effect of IMT. Also, there were statistically significant differences in time between the groups in tiredness of the inspiratory and expiratory respiratory muscles before and after the walking test. The estimated aerobic capacity, heart rate at rest and during exercise, blood pressure, and subjective assessment of muscle and respiratory effort on the Borg scale did not statistically significantly change after training. **Conclusions:** The exercise of the inspiratory respiratory muscles with appropriate resistance improves the muscular strength of the respiratory muscles and reduces their fatigue. We estimate that significant differences in the measurements during the walking test were not detected due to the somewhat low intensity of the test used, which all participants performed without effort. Based on the results, we believe that IMT is appropriate for different groups of physically demanding occupations (e.g., field military services, firefighters, emergency medical services, etc.) as well as for individuals who wear backpacks in hiking activities (hikers, alpinists, mountain skiers, etc.).

Key words: load mass carrying, inspiratory muscles tiring, inspiratory muscle training, soldiers

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Izboljšanje prehojene razdalje v šestih minutah pri pacientih po amputaciji spodnjega uda po odpustu z rehabilitacije

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Uvod: Prehojena razdalja v šestih minutah je dober pokazatelj submaksimalne funkcijske telesne zmogljivost bolnikov, ki kaže raven vsakodnevne telesne aktivnosti. Šestminutni test hoje uporabljamo tudi za oceno hitrosti in vzdržljivosti hoje pri osebah po amputaciji spodnjega uda (1). Namen raziskave je bil ugotoviti, ali pacienti po amputaciji spodnjega uda napredujejo pri šestminutnem testu hoje od konca rehabilitacije do prvega kontrolnega pregleda. **Metode:** Izvedli smo pregled medicinske dokumentacije pacientov po enostranski amputaciji spodnjega uda, ki so bili od 1. januarja do 31. decembra 2017 na rehabilitaciji na Univerzitetnem rehabilitacijskem inštitutu Republike Slovenije - Soča v Ljubljani. Za vse paciente, ki so bili prvič na bolnišnični rehabilitaciji oziroma prvič oskrbljeni s protezo, smo zbrali podatke o izidih šestminutnega testa hoje ob odpustu in ob prvi kontroli po odpustu. Raziskavo je odobrila etična komisija URI - Soča (št. 13/2018). **Rezultati:** V raziskavo je bilo vključenih 35 preiskovancev (32 moških, 3 ženske), ki so bili ob odpustu povprečno stari 64 (SO: $\pm 16,6$; razpon: 21–86) let. Sedem preiskovancev je bilo po transfemoralni (80 %) in 28 (20 %) po transtibialni amputaciji. Prehojena razdalja v šestih minutah se je povprečno izboljšala za 59 (SO: ± 100 ; razpon: 20–980) metrov. Pripomoček, ki je bil najpogosteje uporabljen med hojo, sta bili dve bergli (37 %). Rezultati so pokazali, da je med obema testiranjema v povprečju minilo 207 dni (SD: ± 80 dni, razpon: 66–407 dni). Ugotovili smo, da število dni med obema testiranjema nima statistično pomembnega vpliva na izboljšanje prehojene razdalje ($r = -0,28$, $p = 0,105$). S starostjo je bilo izboljšanje pri prehojeni razdalji manjše. **Zaključek:** Ugotovili smo, da se je prehojena razdalja v šestih minutah po odpustu z rehabilitacije do prve kontrole povečala. Nadaljnje raziskave bi morale vključevati večji vzorec pacientov, v katerega bi vključili več dejavnikov, ki pomembno vplivajo na izide šestminutnega testa hoje.

Ključne besede: amputacija, šestminutni test hoje, spodnji ud, premičnost, proteza, hoja

Improvement in six-minute walking distance in patients after lower-limb amputation after discharge from rehabilitation

Background: The walking distance in six minutes is a good indicator of the submaximal functional body capacity of patients, reflecting the level of daily physical activity. The six-minute walk test is also used to assess walking capacity and endurance of gait in subjects after lower-limb amputation (1). The purpose of the study was to determine to what extent patients after the lower-limb amputation improved at six-minute walk test in the period after discharge from rehabilitation to the first control examination. **Methods:** We examined the medical documentation of patients with unilateral lower-limb amputation, which were hospitalized at the University Rehabilitation Institute, Republic of Slovenia - Soča, Ljubljana, from 1 January 2017 to 31 December 2017. For all patients we collected the results of six-minute walk test after discharge and at the first control examination. The research was approved by the Ethics committee of URI - Soča (13/2018). **Results:** The study included 35 subjects (32 men, 3 women) following lower limb amputation, aged 64 years on average (SD: 16.6; range: 21-86 years). The seven involved transfemoral (80%) and 28 (20%) transtibial amputation. The device most commonly used during walking was 2 crutches (37%). The distance walked in six minutes improved by an average of 59 m (SD: 100) (range: 20-980 m). The results showed that between the two tests, on average 207 days passed (SD: 80 days, range: 66-407 days). We found that the number of days between the two tests has no statistically significant effect on the improvement of the walk distance ($r = -0.28$, $p = 0.105$). With age, the improvement at the walk distance was lower. **Conclusions:** In the study we found that the walk distance in six minutes increased. Further research should include a larger sample of patients in which several factors would be included which significantly influence the outcome of the six-minute walking test.

Key words: amputation, six-minute walk test, lower limb, mobility, prosthesis, walking

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Sporno določilo za skrajšanje čakalnih dob v fizioterapiji leta 2018

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Uvod: Splošni dogovor za pogodbeno leto 2018 (1) je prinesel v osnovnem zdravstvenem varstvu novo, sporno določilo, na katero izvajalci nimajo vpliva. Določil je, da morajo za priznanje celotnega programa doseči normativ dela v utežeh in izvesti obravnavo 250 različnih zavarovanih oseb na en fizioterapevtski tim. Število različnih zavarovanih oseb je Zavod za zdravstveno zavarovanje Slovenije (ZZZS) izvajalcem določil individualno, glede na število fizioterapevtskih timov. V primeru nedoseganja števila različnih zavarovanih oseb bo manjkajoče število procentualno odšteto od celotnega programa, ovrednotenega v utežeh. Novembra 2018 je vlada potrdila tudi Aneks številka 2 k Splošnemu dogovoru za pogodbeno leto 2018 (2), ki s ciljem skrajševanja čakalnih dob omogoča plačilo do 20 odstotkov preseženega programa nad načrtom storitev. **Metode:** Raziskava z uporabo retrospektivne analize rezultatov vključuje 158 (3) izvajalcev fizioterapije, s katerimi je imel ZZZS leta 2018 sklenjeno pogodbo za izvajanje fizioterapevtskih storitev na področju osnovnega zdravstvenega varstva. Program za 558,37 fizioterapevtskega tima je bil porazdeljen med 45 zdravstvenih domov, 11 bolnišnic, 10 zdravilišč, 90 koncesionarjev in 2 socialna zavoda. Izvajalci so obravnavali 165.935 vseh zavarovanih oseb, od tega 145.711 (4) različnih zavarovanih oseb. **Rezultati:** ZZZS je z izvajalci sklenil pogodbe za program v vrednosti 329.259,69 uteži s hkratno zahtevo po realizaciji obravnav 139.209 različnih zavarovanih oseb in naknadno omogočil plačilo dodatnih 65.851,94 uteži s pogojem, da bodo obravnavali dodatnih 27.968 različnih zavarovanih oseb. Sedmim izvajalcem je do realizacije osnovnega letnega programa zmanjkalo 647,71 uteži (0,20 %). 151 izvajalcev je program preseгло za 34.657,10 uteži (10,55 %). Pogodbeno potrebnega števila različnih zavarovanih oseb ni uspelo doseči 14 zdravstvenim domovom (1327 oseb premalo), štirim bolnišnicam (471 oseb premalo), trem zdraviliščem (320 oseb premalo) in trem koncesionarjem (42 oseb premalo). ZZZS tem izvajalcem ni plačal presežnega dela v utežeh, poleg tega pa jim je odtegnil tudi plačilo osnovnega programa zaradi nedoseganja števila različnih zavarovanih oseb: zdravstvenim domovom v vrednosti 3130,393 uteži (5,68 %), bolnišnicam v vrednosti 1111,089 uteži (6,49 %), zdraviliščem v vrednosti 754,880 uteži (5,62 %) in koncesionarjem v vrednosti 99,078 uteži (2,75 %). Za celotno preseženo realizacijo programa je ZZZS vsem izvajalcem skupaj priznal zgolj 15.934,39 uteži (31,15 %). Plačnik je tako prihranil finančna sredstva za realizirano fizioterapevtsko obravnavo kar 10.115 obravnavanih oseb. **Zaključek:** Na podlagi analize omenjene realizacije ugotavljamo, da cilj spornega določila ni bilo skrajšanje čakalnih dob, temveč je šlo kljub realiziranemu povečanemu obsegu dela le za prihranek finančnih sredstev plačnika storitev. Merila so bila moralno sporna in v finančnem delu nezakonita. Za zaščito in napredek fizioterapevtske stroke bi se moralo vodstvo Združenja fizioterapevtov Slovenije – strokovnega združenja poleg vizij dela fizioterapevtov v prihodnosti zavzemati za odpravo vse bolj spornih pogojev dela, s katerimi se več kot polovica njegovega članstva, ki dela v osnovnem zdravstvenem varstvu, spoprijema iz leta v leto.

Ključne besede: določilo, uteži, različne številke ZZZS

A contestable stipulation meant for shortening of waiting times in physiotherapy in 2018

Introduction: The General agreement for the contractual year 2018 (1) in basic health care brought a new, contestable stipulation which the practitioners cannot influence in any way. To attain the confirmation of the entire program they have to reach the working norm in »weights« and carry out the treatment of 250 different insured persons per physiotherapeutic team. The Health Insurance Institute of Slovenia (Zavod za zdravstveno zavarovanje Slovenije – ZZZS) defined the number of different insured persons for each practitioner individually, with regard to the numbers of their therapeutic teams. If they don't reach the defined number of different insured persons, the missing percentage will be deducted from the entire program valued in weights. In November 2018 the government also confirmed Supplement No. 2 to the General agreement for the contractual year 2018 (2) which, in order to help shortening the waiting times, enables payment of surplus in the realized program up to 20%. **Methods:** The study with retrospective analysis comprises all 158 (3) practitioners of physiotherapy who had valid contracts with ZZZS in 2018 for physiotherapeutic activity in the field of basic health care. The program for 558.37 physiotherapeutic teams was distributed amongst 45 community health centers, 11 hospitals, 10 health resorts, 90 licensees and 2 social institutions. The practitioners treated a total of 165,935 insured persons, 145,711 (3) of these were different insured persons. **Results:** ZZZS contracted with practitioners a program amounting to 329,259.69 weights, demanding at the same time the realization of treatments of 139,209 different insured persons and enabling later on the payment of additional 65,851.94 weights on condition that additional 27,968 different insured persons would be treated. 7 practitioners failed in realizing the basic annual program by 647.71 weights (0.20%). 151 practitioners exceeded the program by 34,657.10 weights (10.55%). The necessary number of different insured persons stated in the contract was not reached by 14 community health care centers (they were 13,427 persons short), 4 hospitals (471 persons short), 3 health resorts (320 persons short) and 3 licensees (42 persons short). ZZZS did not pay these practitioners' surplus work in weights, and they were also denied the payment of their basic program because they had not reached the necessary number of treatments of different insured persons: the community health centers were denied the payment of 3130.393 weights (5.68%), the hospitals of 1111.089 weights (6.49%), the health resorts of 754.880 weights (5.62%) and the licensees of 99.078 weights (2.75%). ZZZS's payment for the total surplus realization of the program received by all practitioners together amounted to only 15,934.39 weights (31.15%). This way the payer saved up financial means for realized physiotherapeutic treatment of no less than 10,115 treated persons. **Conclusion:** Based on the analysis of the realization it is obvious that the goal of the contestable stipulation was not shortening of waiting times but in spite of the increased workload, just saving of the payer's financial means. The criteria were morally debatable and, in the financial part, illegal. To protect and promote our profession the leadership of the Slovenian Association of Physiotherapists should, besides its future visions of physiotherapists' work, also advocate the elimination of increasingly controversial working conditions by which more than half of the membership in primary health care has been faced year after year.

Key words: stipulation, weights, different ZZZS numbers

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