

A SBI 2023 BEDREST STUDY

The study focused on the deterioration of neuromuscular and metabolic health during prolonged physical inactivity in both young and older men, as well as the subsequent restoration of health. Various models were employed to study the effects of physical inactivity, with bedrest (BR) being the gold standard. This model, which few institutions have managed to develop in a complex hospital setting, is also used as a ground-based simulation to study the consequences of space flight. Thus, the study design holds significant appeal for numerous research groups and stakeholders. BR is not only used to evaluate the effects of physical inactivity but also to examine the efficacy of various methods, including various countermeasures, interventions and rehabilitation measures, in addressing muscle atrophy and inactivity-induced dysfunction.

A Bed Rest Centre of Science and Research Centre Koper is being led by the Institute for Kinesiology Research. Since 2006 we have organized 6 BR studies, with 10 cohorts, including 97 participants, being in bed between 10 to 35 days. We were one of the first in the world to conduct the Bedrest Study in 2012 on a balanced sample of two groups of elderly subjects to investigate the effects of an intervention (nutrition and cognitive ability) on reducing participants' functional decline in participants. The latest study, in 2023, was of great relevance as it was one of the rarest studies that also included aged participants (> 65 years of age) to be compared with younger counterparts. Specifically, the study included 3 groups:

Group Y: Nine young males (18–35 years) that underwent 21-day BR, without interventions, followed by 21-day recovery.

Group E: Ten older males (65–75 years) that underwent 10-day BR, without interventions, followed by 21-day recovery.

Group Ex: Ten older males (65–75 years) that underwent 10-day BR, with 3 interventions, followed by 21-day recovery. For interventions, participants: (i) performed 2-month prehabilitation to elevate their fitness levels before the BR; (ii) performed virtual reality-driven mental training to prevent decline in motor control during the BR; and (iii) were given extra proteins and amino acids to maintain their metabolism during the BR.

A study was conducted following ethical approval from the National Medical Ethics Committee of the Republic of Slovenia (No. 0120-123/2023/9, issued on 21 June 2023). The first 2 participants joined the study on 21 August 2023, and the last 2 participants completed the study on 25 October 2023. As in our previous studies, all participants successfully completed all examinations.



A total of 43 researchers from 9 organizations (various European scientific, research and health institutions) participated in the study. On 29 March 2023, we organized a scientific meeting where we presented the main findings of the study, which will be published in scientific journals.

The project was co-financed from:

ARIS J5-4593 Physical inactivity induced neuromuscular impairment: comparison of younger and older adults.

INTERREG SLO-ITA X-Brain.net – Network per la cooperazione transfrontaliera finalizzata alla riabilitazione del paziente post-ictus con tecnologie innovative.

PRIN NeuAge – Neuromuscular Aging: Mechanisms and functional implications.

PRIN InactivAge – Inactivity induced neuromuscular impairment through different ages: from children, to young and middle age adults.

PRIN ReActiveAge – The countermeasures to the neuromuscular impairments induced by inactivity and disuse across different ages.

Boštjan Šimunič, Rado Pišot

ŠTUDIJA BEDREST SBI 2023

Študija je bila osredinjena na poslabšanje živčno-mišičnega in presnovnega zdravja med dolgotrajno gibalno neaktivnostjo pri mladih in starejših moških in na poznejše izboljšanje zdravja. Za proučevanje učinkov gibalne neaktivnosti so bili uporabljeni različni modeli, pri čemer je ležanje v postelji (BR) zlati standard. Ta model, ki ga je v kompleksnem bolnišničnem okolju uspelo razviti le malo institucijam, se uporablja tudi kot zemeljski model za proučevanje posledic vesoljskega poleta, številne ugotovitve pa lahko prenašamo tudi na področja razumevanja mehanizmov propadanja pri zasedeni, gibalno neaktivni populaciji ter procesov staranja. Zato je zasnova študije zelo privlačna za številne raziskovalne skupine in udeležence. BR se ne uporablja le za nadzorovano ocenjevanje učinkov gibalne neaktivnosti, temveč tudi za proučevanje učinkovitosti različnih intervencij, vključno s protiukrepi in rehabilitacijo, za odpravljanje strukturnega in funkcionalnega propada ter disfunkcije, ki jo povzroča neaktivnost.

BED REST Center Znanstveno-raziskovalnega središča Koper vodi Inštitut za kineziološke raziskave. Od leta 2006 smo organizirali šest študij BR, v katerih je sodelovalo 10 kohort in 97 udeležencev, ki so bili v postelji od 10 do 35 dni. Bili smo prvi v svetovnem merilu, ki smo leta 2012 izvedli študijo na uravnoteženem vzorcu dveh skupin starejših subjektov z namenom preučevanja vpliva intervencije - v tem primeru kognitivnega treninga, na zmanjšanje funkcionalnega propada. Zadnja študija, izvedena leta 2023, je bila zelo pomembna, saj je bila ena redkih, ki je vključevala tudi starejše udeležence (starejše od 65 let), da bi jih primerjali z mlajšimi. Študija je vključevala tri skupine:

Skupina Y: devet mladih moških (18–35 let), ki so prestali 21-dnevni BR brez intervencij, čemur je sledilo 21-dnevno okrevanje.

Skupina E: deset starejših moških (65–75 let), ki so prestali 10-dnevni BR brez intervencij, čemur je sledilo 21-dnevno okrevanje.

Skupina Ex: deset starejših moških (65–75 let), ki so prestali 10-dnevni BR s tremi intervencijami, čemur je sledilo 21-dnevno okrevanje. Med intervencijami so preiskovanci: 1. izvajali 2-mesečno predpripravo za izboljšanje svoje telesne pripravljenosti pred BR; 2. izvajali mentalni trening z uporabo virtualne resničnosti za preprečevanje upada motorične kontrole med BR; ter 3. dobivali dodatne beljakovine in aminokisliline za vzdrževanje presnove med BR.

Študija je bila izvedena po etični odobritvi, ki jo je 21. junija 2023 izdala Komisija Republike Slovenije za medicinsko etiko (št. 0120-123/2023/9). Prva preiskovanca sta se študiji pridružila 21. avgusta 2023, zadnja pa sta jo končala



25. oktobra 2023. Kot pri naših prejšnjih študijah so vsi preiskovanci uspešno opravili vse preglede.

V študiji je sodelovalo skupno 43 raziskovalcev iz devetih organizacij (različnih evropskih znanstvenoraziskovalnih in zdravstvenih inštitucij). 29. marca 2023 smo organizirali znanstveno srečanje, na katerem smo predstavili glavne ugotovitve študije, ki bodo objavljene v znanstvenih revijah.

Projekt je bil sofinanciran iz:

ARIS J5-4593 Upad živčno-mišičnega sistema po gibalni neaktivnosti: primerjava mlajših in starejših odraslih,

INTERREG SLO-ITA X-Brain.net – Mreža čezmejnega sodelovanja rehabilitacije bolnikov po možganski kapi z uporabo inovativnih tehnologij,

PRIN NeuAge – Neuromuscular Aging: Mechanisms and functional implications,

PRIN InactivAge – Inactivity induced neuromuscular impairment through different ages: from children, to young and middle age adults,

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