Task Book Report Generated on: 07/15/2025

| Program/Discipline- Element/Subdiscipline- Discipline- Discipline | | | | |
|--|--|---|---|--------------------------------|
| Project Title: Integrated Revistance and Aerobic Exercise Training With Small Compact Evercise Equipment Program Discipline: NSBRI | Fiscal Year: | FY 2016 | Task Last Updated: | FY 11/07/2016 |
| Dishion Name: Human Research NSBRI | PI Name: | Ploutz-Snyder, Lori L. Ph.D. | | |
| Program/Discipline: Program/Discipline- Element/Audited/pline: NSBRIMusculoacletal Alterations Team TechPurt: No | Project Title: | Integrated Resistance and Aerobic Exerci | se Training With Small Compact E | xercise Equipment |
| Program/Dicipline- Linear Usbuldscipline- Linear U | Division Name: | Human Research | | |
| Elementz Subdiscipline: Joint Agency Name: TechPort: No | Program/Discipline: | NSBRI | | |
| Human Research Program Elements: (1) Archite/Bisk of Reduced Physical Performance Capabilities Due to Reduced Acrobic Capacity (2) Bane Fracture Risk of Boar, bearing discovered and the program Risks of Reduced Physical Performance Capabilities Due to Reduced Acrobic Capacity (2) Bane Fracture Risk of Boar, bearing discovered and Findurance (3) Moscal Risk of Early Onset Osteoperoxis Due to Reduced Muscle Size, Strength and Findurance (4) Ostea Risk Of Early Onset Osteoperoxis Due to Reduced Muscle Size, Strength and Findurance (4) Ostea Risk Of Early Onset Osteoperoxis Due to Reduced Muscle Size, Strength and Findurance (4) Ostea Risk Of Early Onset Osteoperoxis Due to Reduced Muscle Size, Strength and Findurance (4) Ostea Risk Of Early Onset Osteoperoxis Due to Reduced Acrobic Capacity (2) Bane Fracture Risk of Boar Risk Of Early Onset Osteoperoxis Due to Reduced Acrobic Capacity (2) Bane Fracture Risk of Boar Risk Of Early Onset Osteoperoxis Due to Reduced Acrobic Capacity (2) Bane Fracture Risk of Boar Risk Of Early Onset Osteoperoxis Due to Reduced Acrobic Capacity (2) Bane Risk Of Early Onset Osteoperoxis Due to Reduced Risk Of Early Onset Osteoperoxis Due to Risk Office Risk Offi | Program/Discipline Element/Subdiscipline: | NSBRIMusculoskeletal Alterations Tea | m | |
| Comments: Comments: Previously at Universities Space Research Association/NASA Johnson Space: Comments: Previously at Universities Space Research Association/NASA Johnson Space: One | Joint Agency Name: | | TechPort: | No |
| Human Research Program Risks: 2) Gone Fracture Risk of Bone Fracture due to Spaceflight-induced Changes to Bone (3) Muscle Risk of Early Onset Osteoporosis Due To Spaceflight None Space Biology Cross-Element None Space Biology Special Category: None PI Email: lorips@mich.edu UNIVERSITY Phone: (734) 764-5210 Organization Type: UNIVERSITY Organization Name: University of Michigan PI Address 1: OBL 4170, 1402 Washington IIIs. PI Address 2: School of Kinesiology PI Web Page: City: Ann Arbor State: MI Zip Code: 48109-2013 Congressional District: 12 Comments: Proviously at Universities Space Research Association/NASA Johnson Space: Cortex Health NNJ11ZSA002NA Start Date: 0901/2012 End date: 0901/2012 End Date: 0603/02016 No. of Pach Degree: 0 No. of Master's Candidates: 0 No. of Master's Degrees: 0 No. of Bachelor's Candidates: 0 No. of Bachelor's Candidates: 0 No. of Bachelor's Candidates: 0 Monitoring Center: NOTE: End date changed to 6/30/2016 per NSBR1 (Ed., 6/29/16) NOTE: End date changed to 6/30/2016 per NSBR1 (Ed., 6/29/16) NOTE: End date changed to 6/30/2016 per NSBR1 (Ed., 6/29/16) NOTE: End date changed to 6/30/2016 per Ostober 2014 NSBR1 report submission (Ed., 10/22/14) Key Personnel Changes/Previous PI: Key Personnel Changes/Previous PI: COI Name (Institution): Right Assignment: NOTE: End date Changed to 6/30/2016 per NSBR1 (Ed., 6/29/16) NOTE: End date Changed to 6/30/2016 per Ostober 2014 NSBR1 report submission (Ed., 10/22/14) Laddad. Fedia: (University of California, Irvine) Adms, Gregory: (University of California, Irvine) Adms, Gregory: (University of California, Irvine) Dillon, Eğagar (Tul University of Texas Medical Branch) Dillon, Eğagar (Tul University of Texas Medical Branch) Dillon, Eğagar (Tul University of Texas Medical Branch) | Human Research Program Elements: | (1) HHC :Human Health Countermeasure | s | |
| Space Biology Cross-Element Discipline: Space Biology Special Category: None PI Email: Iorips@umich.edu PI Coganization Type: UNIVERSITY Phone: (734) 764-5210 Organization Name: University of Michigan PI Address 1: OBL 4170, 1402 Washington Hts. PI Address 2: School of Kinesiology PI Web Page: City: Ann Arbor State: MI Zip Code: Ann Arbor Solicitation / Funding Source: 2011 Crew Health NVII1ZNA002NA Start Date: O9/01/2012 End Date: 06/30/2016 No. of Post Does: ON. of Post Does: No. of Post Does: No. of PhD Candidates: No. of PhD Candidates: No. of Master's Candidates: No. of Master's Candidates: No. of Backelor's Candidates: No. of Backelor's Candidates: No. of Backelor's Candidates: NOTE: End date changed to 6/30/2016 per NSBRI (Ed., 6/29/16) NOTE: End date changed to 8/31/2016 per October 2014 NSBRI report submission (Ed., 10/22/14) Key Personnel Changes/Previous PI: Key Personnel Changes/Previous PI: COI Name (Institution): Reyder, Leffrey (Universities Space Research Association) Scott, Jessica (University of California, Irvine) Adms. Gregory (Universities Space Research Association) Scott, Jessica (University of California, Irvine) Adms. Gregory (University of California, Irvine) Ryder, Leffrey (Universities Space Research Association) Scott, Jessica (University of California, Irvine) Adms. Gregory | Human Research Program Risks: | (2) Bone Fracture : Risk of Bone Fracture (3) Muscle : Risk of Impaired Performance | e due to Spaceflight-induced Change e Due to Reduced Muscle Size, Stre | es to Bone |
| Discipline: " Space Biology Special Category: None Pl Email: | Space Biology Element: | None | | |
| PI Email: Jorinsofounich edu Fax: FY PI Organization Type: UNIVERSITY Phone: (734) 764-5210 Organization Type: UNIVERSITY Phone: (734) 764-5210 Organization Name: University of Michigan PI Address 1: OBL 4170, 1402 Washington Hts. PI Address 2: School of Kinesiology PI Web Page: City: Ann Arbor State: MI Zip Code: 48109-2013 Congressional District: 12 Comments: Previously at Universities Space Research Association/NASA Johnson Space Center until July 2016. Project Type: Ground Solicitation / Funding Source: 2011 Crew Health NNJ11ZSA002NA Start Date: 0901/2012 End Date: 06/30/2016 No. of Post Does: 0 No. of PhD Degrees: 0 No. of PhD Candidates: 0 No. of Master' Degrees: 0 No. of Machelor's Candidates: 0 No. of Bachelor's Degrees: 0 No. of Bachelor's Candidates: 0 Monitoring Center: NSBRI Contact Email: Flight Program: NOTE: End date changed to 6/30/2016 per NSBRI (Ed., 6/29/16) NOTE: End date changed to 8/31/2016 per Cotober 2014 NSBRI report submission (Ed., 10/22/14) Key Personnel Changes/Previous PI: Addad, Fadia (University of California, Irvine) Adams, Gregory (University of California, Irvine) Adams, Gregory (University of California, Irvine) Note: Space Research Association) Soct, Lessica (University of California, Irvine) Adams, Gregory (University of California, Irvine) Adams, Gregory (University of Texas Medical Branch) Performance Goal No.: | Space Biology Cross-Element Discipline: | None | | |
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| | Grant/Contract No.: | NCC 9-58-MA02801 | | |
| Performance Goal Text: | Performance Goal No.: | | | |
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Task Book Report Generated on: 07/15/2025

| Task Description: | This proposal aims to validate in an analog setting a small compact exercise device for the protection of cardiovascular, muscle, and bone health. This study leverages both currently funded National Space Biomedical Research Institute (NSBRI) and NASA work to bring together for the first time, a promising new exercise device and exercise prescription thus placing this study at a high countermeasure readiness level (moving from 6-7). More specifically, the NSBRI funded M-MED device uses a flywheel to provide loading for either high force-low repetition resistance exercise or low force-high repetition, endurance exercise (rowing). Recent data support M-MED training effectiveness in both ambulatory subjects and over 10 days of muscle unloading using unilateral lower limb suspension model. Accordingly, a new NASA funded exercise prescription study integrating resistance and aerobic training (iRAT) has been effective in the preservation of muscle and cardiovascular function over 14 days of bedrest, but requires the use of 5 different exercise machines. This proposal will combine the M-MED exercise device and the iRAT exercise prescription into a 70 day bedrest study. Outcome measurements related to cardiovascular, muscle and bone health will be obtained and integrated to assess countermeasure effectiveness. | |
|--------------------------------------|--|--|
| Rationale for HRP Directed Research: | | |
| Research Impact/Earth Benefits: | Research Impact: The comparison of a single exercise device to an International Space Station-like suite of exercise devices will inform long duration exploration exercise hardware requirements as well as provide a proof of concept of a exercise efficacy using a single device. Earth Benefits: Developing the most efficient exercise prescription is valuable to a wide population who seek to optimize the health benefits of exercise using as little time as possible. The validation of novel compact exercise hardware may also be useful for other situation where space constraints limit the availability of large scale exercise equipment. | |
| Task Progress: | Final report. Study complete; manuscripts being prepared. Muscle biopsy analyses continue at University of California Irvine. | |
| Bibliography Type: | Description: (Last Updated: 06/04/2024) | |
| Articles in Peer-reviewed Journals | Ploutz-Snyder LL, Downs M, Goetchius E, Crowell B, English KL, Ploutz-Snyder R, Ryder JW, Dillon EL, Sheffield-Moore M, Scott JM. "Exercise training mitigates multi-system deconditioning during bed rest." Med Sci Sports Exerc. 2018 Sep;50(9):1920-8. https://doi.org/10.1249/MSS.0000000000000001618 ; PubMed PMID: 29924746 , Sep-2018 | |
| Articles in Peer-reviewed Journals | English KL, Downs M, Goetchius E, Buxton R, Ryder JW, Ploutz-Snyder R, Guilliams ME, Scott JM, Ploutz-Snyder LL. "High intensity training during spaceflight: Results from the NASA Sprint Study." npj Microgravity. 2020 Aug 18;6(1):21. https://doi.org/10.1038/s41526-020-00111-x ; PMID: 33574275 , Aug-2020 | |
| Articles in Peer-reviewed Journals | Downs ME, Scott JM, Ploutz-Snyder LL, Ploutz-Snyder R, Goetchius E, Buxton RE, Danesi CP, Randolph KM, Urban RJ, Sheffield-Moore M, Dillon EL. "Exercise and testosterone countermeasures to mitigate metabolic changes during bed rest." Life Sci Space Res. 2020 Aug;26:97-104. https://doi.org/10.1016/j.lssr.2020.03.008 ; PMID: 32718692 ; <a 10.1016="" doi.org="" href="https://doi.org/10.1016/j.lssr.2020.03.008; PMID: 32718692 ; <a href="</td"> | |
| Articles in Peer-reviewed Journals | Scott JM, Downs M, Buxton R, Goetchius E, Crowell B, Ploutz-Snyder R, Hackney KJ, Ryder J, English K, Ploutz-Snyder LL. "Disuse-induced muscle loss and rehabilitation: The National Aeronautics and Space Administration bed rest study." Crit Care Explor. 2020 Dec;2(12):e0269. <a 2024="" 23.="" <a="" ahead="" apr="" attenuates="" bedrest."="" exerc.="" exercise="" genomic="" href="mailto:pmid:38650118" med="" mitochondria="" muscle="" of="" online="" print.="" response="" sci="" sports="" the="" to="" training="">PMID: 38650118 , Apr-2024 | |