Task Book Report Generated on: 05/08/2024

Program/Discipline- Element/Subdiscipline- Discipline- Discipline				
Project Title: Integrated Resistance and Actobic Excesic Training With Small Compact Excesic Equipment Division Name:	Fiscal Year:	FY 2015	Task Last Updated:	FY 11/04/2015
Distribut Name: Hamma Research NSBRI	PI Name:	Ploutz-Snyder, Lori L. Ph.D.		
Program/Discipline: Program/Discipline- Element/Audited/pline: NSBRIMusculoakcleral Alterations Team TechPort: No Human Research Program Elements: (I) HHC-Human Health Countermeasures (I) Human Research Program Elements: (I) Human Research Program Islane (I) Burde-Risk of Reduced Physical Performance Capabilities Due to Reduced Aerobic Capacity (I) Burde-Risk of Reduced Physical Performance Capabilities Due to Reduced Aerobic Capacity (I) Muscle-Risk of Reduced Physical Performance Capabilities Due to Reduced Abusele Soz, Nue-guit and Findurance (I) Muscle-Risk of Early Onset Onteoperosis Due To Spaceflight-induced Changes to Bone (I) Muscle-Risk of Farly Onset Onteoperosis Due To Spaceflight None Space Biology Element: None None None PE Carly Onset Category: Performance University of Michigan PI Address 2: City: Ann Arbor Allow-2013 Congressional District: City: Ann Arbor Ann Arbor Allow-2013 Congressional District: City: Ann Arbor Ann Arbor Ann Arbor State: MI Comments: Project Type: GROUND Solicitation / Funding Source: 2011 Crew Health NNJ11ZSA002NA Start Date: 0901/2012 End Date: 0603/2016 No. of Phot Degrees: 0 No. of Master's Candidates: 2 No. of Master's Candidates: 3 No. of Backelor's Candidates: 0 No. of Master's Candidates: No. of Master's Candidates: 0 No. of Master's Candidates: No. of Master's Candidates: No. of Master's Candidates: No. of Master's Candidates: No	Project Title:	Integrated Resistance and Aerobic Exerci	se Training With Small Compact E	xercise Equipment
Program/Dicipline- Linear Shudiscipline: NSBRI-Muscaloskeletal Alterations Team	Division Name:	Human Research		
Elements/Subdiscipline: Joint Agency Name: TechPort: No	Program/Discipline:	NSBRI		
Human Research Program Elements: (1) Archite/Bais of Reduced Physical Performance Capabilities Due to Reduced Acrobic Capacity (2) Bone Practure Risk of Roch Canteur due to Spaceflight-induced Changes to Rone (3) MacgeRisk of Impaired Performance Due to Reduced Muscle Size, Strength and Endurance (4) Ostere Risk Of Early Onset Osteoporosis Due To Spaceflight-induced Changes to Rone (3) MacgeRisk of Impaired Performance Due to Reduced Muscle Size, Strength and Endurance (4) Ostere Risk Of Early Onset Osteoporosis Due To Spaceflight None Space Biology Special Category: None PI Email: None PI Email: None PI Email: None PI Marker Size OBL 4470, 1402 Washington His. PI Address 1: OBL 4470, 1402 Washington His. 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 / Familia Source: 2011 Crew Health NNI117SA002NA Start Date: 09.001/2012 End Date: 06.0302016 No. of Pab Degrees: 0 No. of Pab Candidates: 2 No. of Master's Candidates: 3 No. of Bachelor's Plagrees: On. of Bachelor's Candidates: On. of Bachelor's Candidates: On. of Bachelor's Candidates: On. of Bachelor's Candidates: NOTE: End date changed to 630/2016 per NSBRI (Ed., 629/16) NOTE: End date changed to 831/2016 per October 2014 NSBRI report submission (Ed., 1022/14) Haddad, Fadia (University of California, Irvine) Calams, Grappy Clusters of California, Irvine) Adams, Grappy Clustersity of California, Irvine) Pollon, Edger (The University of California, Irvine) Dillon, Edger (The University of California, Irvine) Dillon, Edger (The University of California, Irvine) Dillon, Edger (The University of Taxa Medical Branch)	Program/Discipline Element/Subdiscipline:	NSBRIMusculoskeletal Alterations Tea	m	
Comments: Comm	Joint Agency Name:		TechPort:	No
Human Research Program Risks: 2) Canne Fracture Risk of Bone Fracture due to Spaceflight induced Changes Bone (3) Muscle Risk of Early Onset Osteoporosis Due To Spaceflight None Space Biology Cross-Element None Space Biology Special Category: None PI Email: Iorips@umich.edu PI Organization Type: UNIVERSITY Phone: (734) 764-5210 Organization Name: University of Michigan PI Address 1: OBL 4170, 1402 Washington Ills. 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 Center until July 2016. Project Type: GROUND Solicitation / Funding Source: 0901/2012 End Date: 0603/2016 No. of Pach Degree: 0 No. of Master's Candidates: 3 No. of Bachelor's Degrees: 0 No. of Master's Candidates: 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 NSBRI (Ed., 6/29/16) NOTE: End date changed to 6/30/2016 per NSBRI (Ed., 6/29/16) NOTE: End date changed to 6/30/2016 per NSBRI (Ed., 6/29/16) NOTE: End date changed to 6/30/2016 per NSBRI (Ed., 6/29/16) NOTE: End date changed to 6/30/2016 per NSBRI (Ed., 6/29/16) NOTE: End date Changed to 6/30/2016 per NSBRI (Ed., 6/29/16) NOTE: End date Changed to 6/30/2016 per NSBRI (Ed., 6/29/16) NOTE: End date Changed to 6/30/2016 per NSBRI (Ed., 6/29/16) NOTE: End date Changed to 6/30/2016 per NSBRI (Ed., 6/29/16) NOTE: End date Changed to 6/30/2016 per NSBRI (Ed., 6/29/16) NOTE: End date Changed to 6/30/2016 per NSBRI (Ed., 6/29/16) NOTE: End date Changed to 6/30/2016 per NSBRI (Ed., 6/29/16) NOTE: End date Changed to 6/30/2016 per NSBRI (Ed., 6/29/16) NOTE: End date Changed to 6/30/2016 per NSBRI (Ed., 6/29/16) NOTE: End date Changed to 6/30/2016 per NSBRI (Ed., 6/29/16) NOTE: End date Changed to 6/30/2016 per NSBRI (Ed., 6/29/16) NOTE: End date Changed to 6/30/2016 per NSBRI (Ed., 6/29/16) NOTE: End date Changed to 6/30/2016 per NSBR	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 State: MI Zip Code: Ann Arbor State: MI Zip Code: Ann Arbor Solicitation/NASA Johnson Space Center until July 2016. Project Type: GROUND Solicitation / Funding Source: 2011 Crew Health NNJ11ZSA002NA Start Date: O9/01/2012 End Date: 06/30/2016 No. of Phab Degrees: No. of Phab Degrees: No. of Master's Candidates: No. of Master's Candidates: No. of Master'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): Reyer, Jeffrey Universities Space Research Association (Scoti, Jessica (University of California, Irvine) California, Irvine) Scoti, Jessica (University of California, Irvine) Scoti, Jessica (University of California, Irvine) California, Irvine) Reyer, Jeffrey Universities Space Research Association (Scoti, Jessica (University of California, Irvine) Reyer, Jeffrey (Universities Space Research Association) Dillon, Edgar (The University of California, Irvine) Reyer, Jeffrey (Universities Space Research Association) Dillon, Edgar (The University of California, Irvine) Reyer (University of California, Irvine) Reyer, Jeffrey (Universities Space Research Association) Dillon, Edgar (The University of California, Irvine) Reyer, Jeffrey (Universities Space Research Association) Dillon, Edgar (The University of California, Irvine) Reyer, Jeffrey (Universities Space Research Association)	Human Research Program Risks:	(2) Bone Fracture :Risk of Bone Fracture due to Spaceflight-induced Changes to Bone (3) Muscle :Risk of Impaired Performance Due to Reduced Muscle Size, Strength and Endurance		
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Performance Goal No.:	COI Name (Institution):	Caiozzo, Vincent (University of California, Irvine) Adams, Gregory (University of California, Irvine) Ryder, Jeffrey (Universities Space Research Association) Scott, Jessica (Universities Space Research Association)		
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Task Book Report Generated on: 05/08/2024

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 (NSRBRI) 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 bed rest, 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 bed rest 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: 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.

Research Impact/Earth Benefits:

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 situations where space constraints limit the availability of large scale exercise equipment. The integration of our data with the many other Principal Investigators (PIs) who shared the same bed rest subjects will provide an invaluable opportunity to understand the role of exercise for the prevention of bed rest (i.e., hospital based) deconditioning.

Task Progress:

Subject data collection was completed in December 2014. The control and traditional exercise subjects (Human Health and Countermeasure element funded) data has been statistically analyzed and presented in preliminary form for an internal NASA audience. Results showed excellent protection of maximal aerobic capacity and reasonable protection of the thigh muscle size and performance while calf cross sectional area and performance still show deficits with about 2/3 of the loss mitigated with the exercise program. The muscle biopsy analyses (Adams UC Irvine - NSBRI funded) are underway. Because these are batch analyzed and time consuming, preliminary data are not yet available, but will be forthcoming during this year.

We completed subject bed rest data collection in December 2014. Preliminary performance data were presented at the Human Research Program (HRP) Investigator Workshop in early 2015. All performance data are analyzed with the exception of some individual muscle MRI cross sectional area analyses; these should be completed by the end of calendar year 2015. 2/3 of the loss was mitigated with the exercise program.

Bibliography Type:

Description: (Last Updated: 04/29/2023)