**Fiscal Year:** FY 2007  
**Task Last Updated:** FY 02/12/2007

**PI Name:** Shibata, Shigeki  M.D., Ph.D.  
**Project Title:** Impacts of Bed Rest, Exercise and Aging on Dynamic Ventricular-Arterial Coupling (Postdoctoral Fellowship)

**Division Name:** Human Research  
**Program/Discipline:** NSBRI Teams  
**Program/Discipline--Element/Subdiscipline:** NSBRI Teams--Cardiovascular Alterations Team

**Human Research Program Elements:** None  
**Human Research Program Risks:** (1) **Aerobic** Risk of Reduced Physical Performance Capabilities Due to Reduced Aerobic Capacity

**Space Biology Element:** None  
**Space Biology Cross-Element Discipline:** None  
**Space Biology Special Category:** None

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**PI Organization Type:** UNIVERSITY  
**Phone:** 214-345-6501  
**Organization Name:** The University of Texas Southwestern Medical Center at Dallas  
**PI Address 1:** 7232 Greenville Avenue

**City:** Dallas  
**State:** TX  
**Zip Code:** 75231  
**Congressional District:** 30

**Comments:**

**Project Type:** GROUND  
**Solicitation:** 2006 NSBRI-RFP-06-01 Postdoctoral Fellowships  
**Start Date:** 12/01/2006  
**End Date:** 11/30/2008

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**Contact Monitor:**  
**Contact Email:**  
**Flight Program:**  
**Flight Assignment:**  
**Key Personnel Changes/Previous PI:**

**COI Name (Institution):** Levine, Benjamin  ( MENTOR/The University of Texas Southwestern Medical Center at Dallas )  
**Grant/Contract No.:** NCC 9-58-PF01101

**Performance Goal No.:**

**Performance Goal Text:**

**POSTDOCTORAL FELLOWSHIP**

Ventricular-arterial stiffening after microgravity exposure, leading to orthostatic intolerance and reduced exercise capacity, has been a high-priority problem for NASA. One recent study by Dr. Ben Levine and colleagues demonstrated that three weeks of bed rest were equivalent to 30 years of aging for maximal oxygen transport capacity. This study and others have suggested that some of the loss of functional capacity with aging and after microgravity exposure may be due to physical inactivity. We have developed a novel concept of dynamic ventricular-arterial coupling to assess the complex interaction between ventricular and arterial compliance and plan to apply this paradigm to aging and bed rest with an exercise countermeasure.
### Task Description:

The objective of this project is to assess the effects of aging and microgravity exposure on dynamic ventricular-arterial coupling, and to determine the optimal physical activity to prevent the changes in this interaction. To accomplish these objectives, we aim to:

- Recruit cross-sectional sedentary individuals between the ages of 20 to 80 yrs and with four different doses of life-long exercise, and;
- Perform five-week, six-degree head-down bed rest with and without rowing ergometry plus resistance training in healthy young individuals.

Dynamic ventricular-arterial coupling will be evaluated by transfer function analysis among beat-by-beat changes in left ventricular-end diastolic volume and pressure, stroke volume and systolic blood pressure. The findings from this study will determine the effectiveness of an exercise countermeasure for prolonged microgravity exposure and extend research on parallels between bed rest and aging. In addition, we have found remarkable impairment of dynamic ventricular-arterial coupling in congestive heart failure (CHF), suggesting that the findings will be applicable for reducing the prevalence of CHF with age.

As such, this project has great Earth relevant healthcare benefits. Finally, this project will be performed as a part of Dr. Levine's funded NSBRI and NIH research, which includes comprehensive evaluations for cardiovascular physiology during prolonged simulated microgravity and aging.

### Rationale for HRP Directed Research:

We have found remarkable impairment of dynamic ventricular-arterial coupling in congestive heart failure (CHF), suggesting that the findings will be applicable for reducing the prevalence of CHF with age.

### Research Impact/Earth Benefits:

New project for FY2007.

### Bibliography Type:

Description: (Last Updated: 07/12/2013)