

CARDIOVASCULAR DISEASE RISK IN NASA ASTRONAUTS ACROSS THE LIFESPAN: HISTORICAL COHORT STUDIES

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Acute effects of spaceflight on the cardiovascular system have been studied extensively, but the combined chronic effects of spaceflight and aging are not well understood. Preparation for and participation in space flight activities are potentially associated with cardiovascular disease risk factors (e.g., altered dietary and exercise habits, physical and emotional stress, circadian shifts, radiation). Further, astronauts who travel into space multiple times may be at an increased risk across their lifespan. However, comparing the risk of cardiovascular disease in astronauts to other large cohorts is difficult. For example, comparisons between astronauts and large national cohorts, such as the National Health and Nutrition Examination Survey and the National Health Information Survey, are hampered by significant differences in health status between astronauts and the general population, and most of these national studies fail to provide longitudinal data on population health. To address those limitations, NASA's Longitudinal Study of Astronaut Health previously sought to compare the astronauts to a cohort of civil servants employed at the Johnson Space Center. However, differences between the astronauts and civil servants at the beginning of the study, as well as differential follow up, limited the ability to interpret the results.

To resolve some of these limitations, two unique cohorts of healthy workers, U.S. Air Force aviators and Cooper Center Longitudinal Study participants, have been identified as potential comparison populations for the astronaut corps. The Air Force cohort was chosen due to similarities in health at selection, screening, and some occupational exposures that Air Force aviators endure, many of which mirror that of the astronaut corps. The Cooper Clinic cohort, a generally healthy prevention cohort, was chosen for the vast array of clinical cardiovascular measures collected in a longitudinal manner complementary to those collected on astronauts, for a large number of subjects since 1971. The purpose of this study is to understand the incidence of cardiovascular disease outcomes and risk factors in the astronaut corps and determine whether the rates of disease are different than these two cohorts. The research questions are:

1. Are there differences in the incidence of CVD outcomes (MI, revascularization, and stroke) between each cohort and the NASA Astronaut cohort?
2. Are there differences in the incidence of CVD risks (hypertension, hyperlipidemia, arrhythmias, and diabetes) between each cohort and the NASA Astronaut cohort?
3. Are there differences between each cohort and the NASA Astronaut cohort in how CVD risk factors (e.g., lipids, behaviors) change across time?

Collectively, results from these studies will enhance our understanding of how cardiovascular disease outcomes and risk factors change across time in astronauts compared to other longitudinally-studied healthy cohorts and determine if there are interactions between or additive effects of the occupational health effects of spaceflight exposure and normal aging.