

Space Adaptation Back Pain A Retrospective Study

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Space Adaption Back Pain



- Astronauts frequently report back pain in the early phase of space flight as they adapt to microgravity
- The epidemiology of space adaptation back pain (SABP) has not been well established



Objectives



- Determine the exact incidence of SABP among astronauts
- Develop a case definition of SABP
- Delineate the nature and pattern of SABP
- Review available treatments and their effectiveness in relieving SABP
- Identify any operational impact of SABP

Methods



Retrospective review of all available mission medical records of astronauts in the U.S. space program, which included:

- Preflight medical exams
- Flight surgeon logs
- Postflight medical exams
- Postflight medical debriefs
- Standardized back pain questionnaire
- Private Medical Conference (PMC) Tool

Missions



- Mercury
- Gemini
- Apollo
- Apollo-Soyuz Test Project (ASTP)
- Mir (U.S. Astronauts only)
- Skylab
- International Space Station (ISS) missions (Expedition 1 through 15)
- Shuttle missions STS-1 through STS-122 (Except STS-51L Challenger and STS-107 Columbia)

Study Size



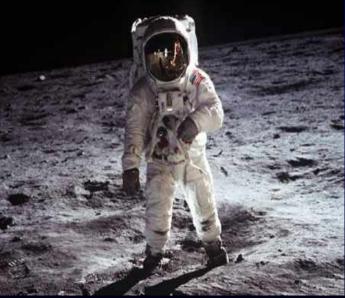
A total of 772 astronaut flights were reviewed



Case Definition of SABP



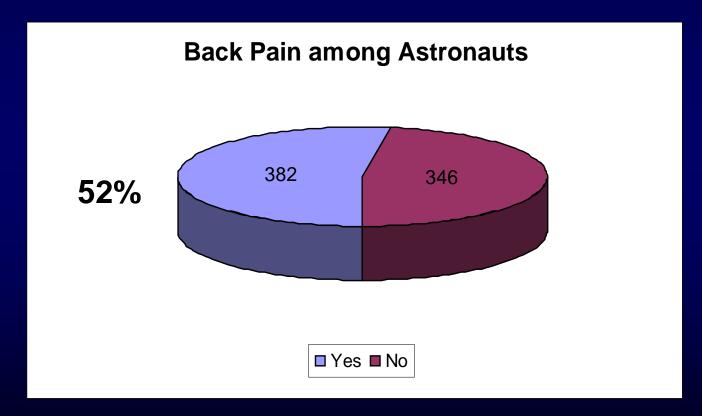
- Symptoms are not precipitated by an injury or related to prolonged recumbent sitting on the launch pad
- Symptoms develop within the first 5 days of space flight
- Multiple days of in-flight back pain were considered as one case



Results

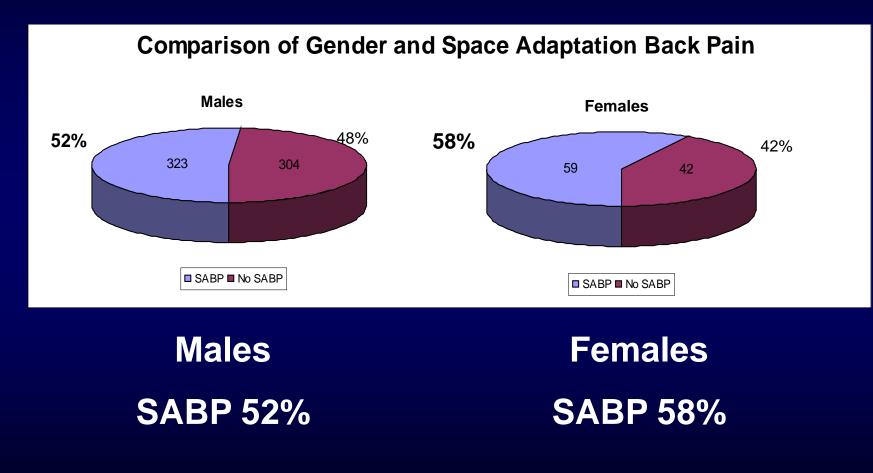


Incidence of SABP was 52%



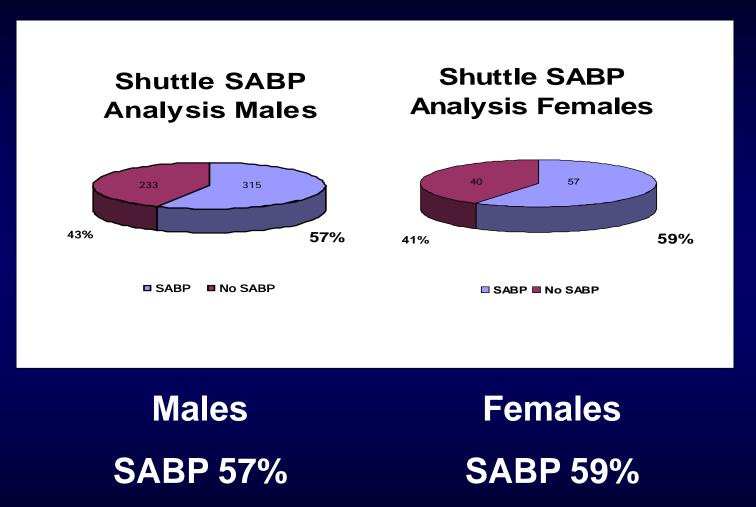
Gender Analysis





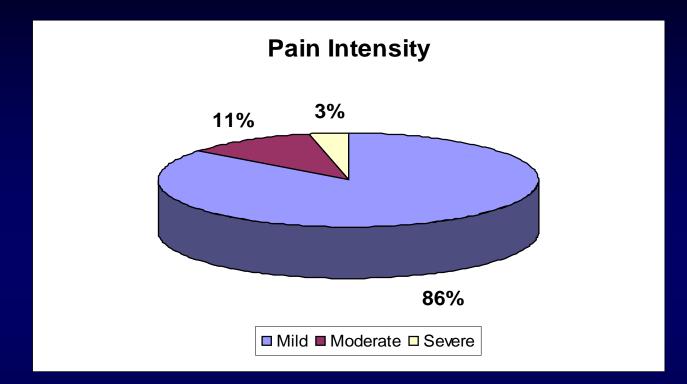
Shuttle Gender Analysis





SABP Intensity

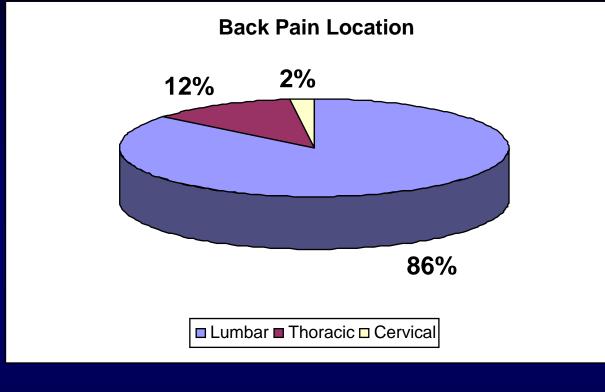




Mild pain86%Moderate pain11%Severe pain3%

SABP Location



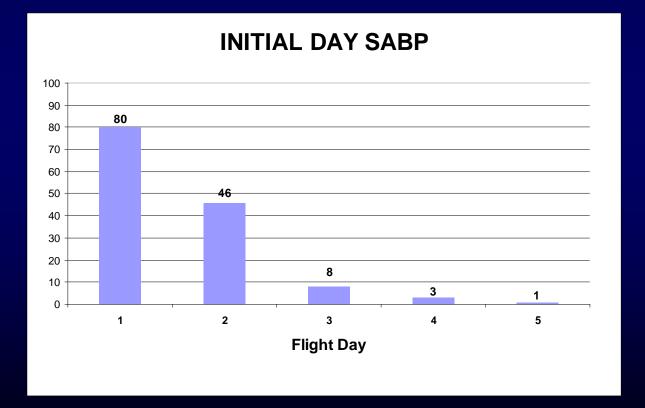


Lumbar	86%
Thoracic	12%
Cervical	2%

Onset of SABP



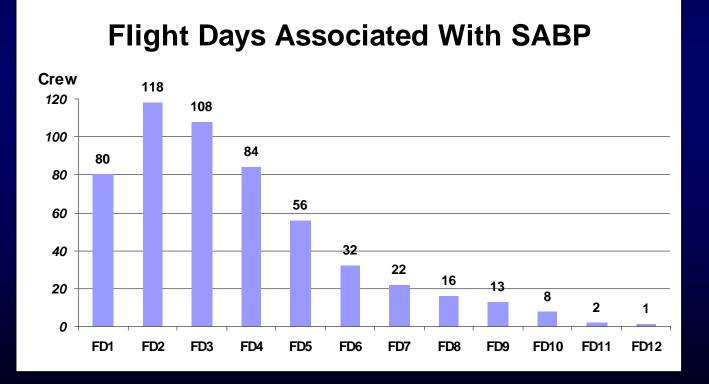
In most SABP cases, the initial onset of symptoms was within the first 2 days of space flight. Only 12 astronauts reported an onset of symptoms after flight day 2



SABP & Flight Days

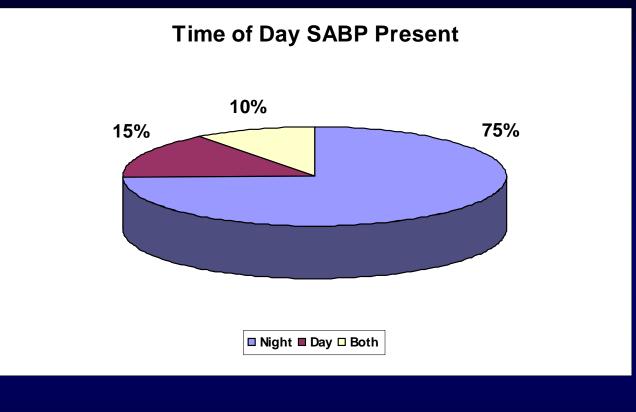


SABP is present in the early phase of spaceflight, with a peak prevalence on flight day 2 and none reported after flight day 12



Temporal Component

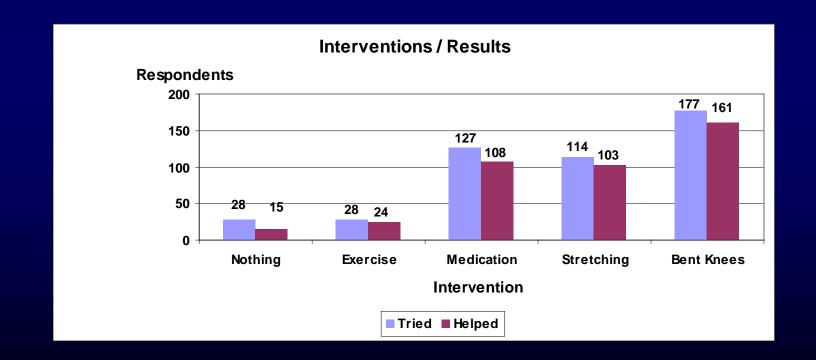




Night	75%
Day	15%
Both	10%



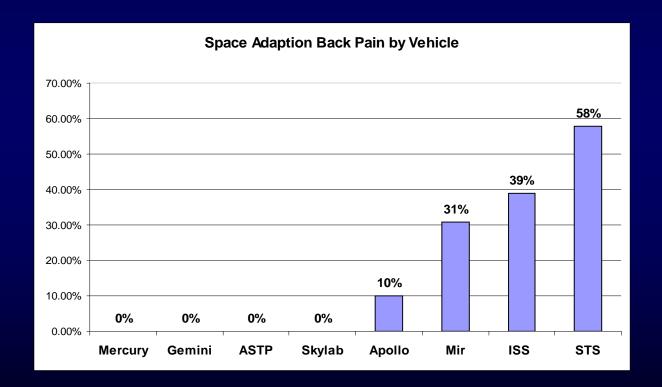
The most effective treatments were bending the knees to the chest (91%), stretching the lumbar spine (90%) and anti-inflammatory medication (85%)



Vehicle Analysis

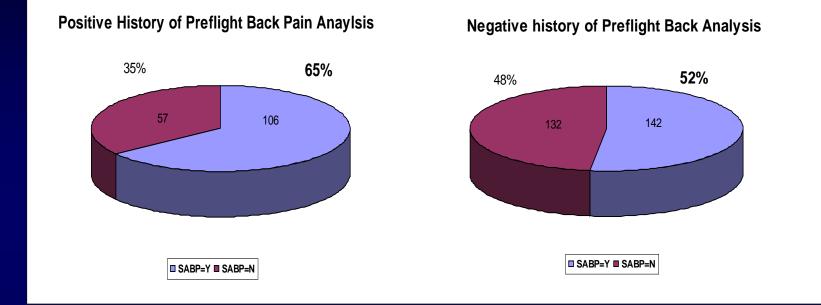


The incidence of SABP varied in relation to the space flight vehicle



History of Pre-flight Back Pain



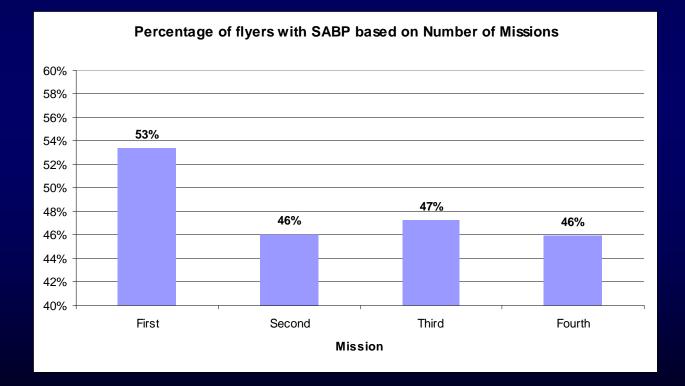


Positive History SABP 65% Negative History SABP 52%

SABP Based on Number of Missions



Among astronauts who flew more than one mission; they had a higher incidence of SABP on their first mission than on subsequent missions



SABP Characteristics



- Symptoms are usually mild to moderate
- Symptoms are usually localized to the lumbar region
- Symptoms are described as an ache or stiffness
- Symptoms typically occur during the sleep period
- Neurological symptoms (radicular pain, numbness, tingling) are absent
- Symptoms tend to improve or resolve with the use of bending the knees to the chest, stretching of the lumbar spine, or anti-inflammatory medication

Conclusions



- The incidence of SABP has been determined to be 53% among astronauts in the U.S. space program
- Most cases of SABP are mild, self-limited, or respond to available treatments
- There are no currently accepted preventive measures for SABP
- It is difficult to predict who will develop SABP
- The precise mechanism and spinal structures responsible for SABP are uncertain
- There was no documented evidence of direct operational mission impact related to SABP
- There is *potential* mission impact related to uncontrolled pain, sleep disturbance, or the adverse side effects of antiinflammatory medications

Limitations



- Retrospective study
 - Missing data
 - Misinterpretation of existing data
- Standardized back pain questionnaire only used on Shuttle missions
- Reluctance among astronauts to report in-flight back pain

Recommendations



- Promote the most effective treatments of SABP with the least potential for adverse side effects
- Sleep accommodations on all space flight vehicles should allow for crewmembers to bend their knees to the chest
- The precise mechanism, spinal structures and causative factors associated with SABP should be further investigated in order to facilitate the development of preventive measures, as well as additional effective treatments

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Questions





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