Why Space?
The opportunity for Health and Life Science Innovation
*Organisations featured does not necessarily represent an official endorsement of the paper or its recommendations.*
As the global community seeks to recover post covid-19, the opportunity to galvanise our excellence in health and life sciences, and the strong investments in developing sovereign space launch capability, could be a catalyst for future innovation and strengthen existing global ties.

Without funding, infrastructure, relationships and agreements, it is challenging for UK scientists to develop/sustain long-term collaborative research programmes with international agencies, principally ESA, and other commercial partners.
Why Space? Process

Two space health and life science community workshops attended by government, industry, clinical and academic stakeholders, along with surveys, and one-on-one interviews.

Process of peer-review for all the case studies submitted was carried out by the working group assisted by a panel of independent experts (who are listed below):

Professor Hagan Bayley (University of Oxford),
Dr Tim Etheridge (University of Exeter),
Libby Jackson (UK Space Agency),
Dr Michael Adeogun (National Physical Laboratory),
Dr Barbara Ghinelli (UKRI-STFC),
Dr Noriane Simon (UKRI-BBSRC)

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Why Space? Process

Open call for papers gathered >50 authored contributions from the research community, which helped broaden our horizons of untapped potential for cross-sector innovation.

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Exercise is a crucial part of human spaceflight; used as a countermeasure against the negative physiological impact of prolonged stays in micro- and reduced-gravity environments.

Reloading of musculoskeletal and cardiovascular systems after spaceflight and in ‘return-to-play’ scenarios in sport both offer an opportunity to address the reduced physical fitness.
Solent University Case Study

Solent University staff are currently involved in a variety of projects that would benefit from the opportunity to be further involved in space-related research.

Exposure to reduced gravity levels during rehabilitation from lower-limb injuries

Image Credits: Dr Adam Hawkey
Solent University Case Study

Application of whole-body vibration training (WBVT) for health and athletic performance

Vibration exercise: evaluating its efficacy and safety on the musculoskeletal system

Whole-body vibration training (WBVT) has been shown to have a variety of health and fitness benefits, including increased bone density, enhanced muscle strength, improved balance, and reduced risk of injury.

**Vibration exercise benefits**
- Increased bone density
- Enhanced muscle strength
- Improved balance
- Reduced risk of injury

**Applying WBVT**

WBVT is typically applied using a variety of vibrating platforms, including those mounted on the floor, which can be adjusted to varying frequencies and amplitudes. Participants are instructed to stand or lie on the vibrating platform, while the vibrations stimulate their muscles and bones.

**Efficacy and safety considerations**

While WBVT has been shown to have numerous benefits, it is important to consider the potential risks and limitations. For example, individuals with certain medical conditions, such as pacemakers, may need to avoid certain types of WBVT.

**Conclusion**

WBVT is a promising intervention for improving health and fitness, but further research is needed to fully understand its potential benefits and limitations.

Image Credits: Dr Adam Hawkey
Why Space? Process

These case studies highlighted the need for bridging mechanisms between capability and access to overcome the barriers to conducting space-related research, for both exploration and terrestrial benefit.

To aid this process, contributions were amalgamated into five Thematic chapters, each with an assigned editor from the paper’s working group.
Why Space? Thematic Chapters

• Life Science
• Human Factors, Psychology & Neuroscience
• Bio-Medical and Clinical Considerations
• Engineering, Robotics, Data and AI
• Education and Knowledge Exchange
Why Space? Key Recommendations

• Harness the innovation opportunity from existing research portfolios:
  Establish dedicated funding pilots with funders of Health and Life science research, to galvanise existing scientific capital on translational activities with space. For example, following the 2020 UKRI deep dive into space research funding, the establishment of a cross-UKRI (UK Research and Innovation) Space working group, provides an opportunity to consider how funding in this area might be better supported and extended to include space related Health & Life Science research.

• Create a proof of concept/ catalyst program for Industry:
  To de-risk industrial R&D, facilitate the growth of the market opportunity and the commercialisation activity with space, a catalyst-like programme is recommended to drive an innovation pipeline. This would in turn stimulate the UK’s launch and provider network, working with the UK Space Agency, by growing a sustainable customer base.
Why Space? Key Recommendations

• Fund high-risk high-reward thematic centres:

In keeping with the UK Government's renewed interest in high-risk, high-reward research and innovation and inspired by the success of NASA's Translational Research Institute for Space Health, we propose setting up at least three UK challenge-led R&D centres. These would provide opportunities to support Government priorities to deliver an R&D based future economy, contributing to the UK's position as a science superpower and in line with ambitions articulated in the creation of the Advanced Research & Invention Agency.

• Inspire careers in the Health & Life Sciences:

Develop educational programs and outreach opportunities to promote new and existing career pathways in the Health and Life Sciences, particularly those associated with the Space Sector. These activities will further encourage and enthuse the next generation of scientists, engineers, teachers, healthcare professionals, and astronauts.
Why Space? Key Recommendations

• Establish a dedicated knowledge exchange infrastructure:
  Enabling knowledge exchange activities at various stages, from early research through to potential commercial and industry applications. This will support engagement with a broad customer base who might benefit from accessing knowledge in relation to space economies and terrestrial benefit, growing customer base for future space and lunar economies.

• Join the International Space Life Sciences Working Group (ISLSWG):
  Currently several of the major international space agencies (Including NASA, ESA, DLR etc) sit on this group. By lobbying for the UK Space Agency to join, this will raise the UK’s International Profile, connect its global leading expertise in Health and Life science research and foster other opportunities to enhance our representation with international groups, future exploration activities, and roadmaps.
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