VR Solutions to Interpersonal Conflict in a Martian Environment

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URL of team video: www.youtube.com/etc

Description of problem and its importance

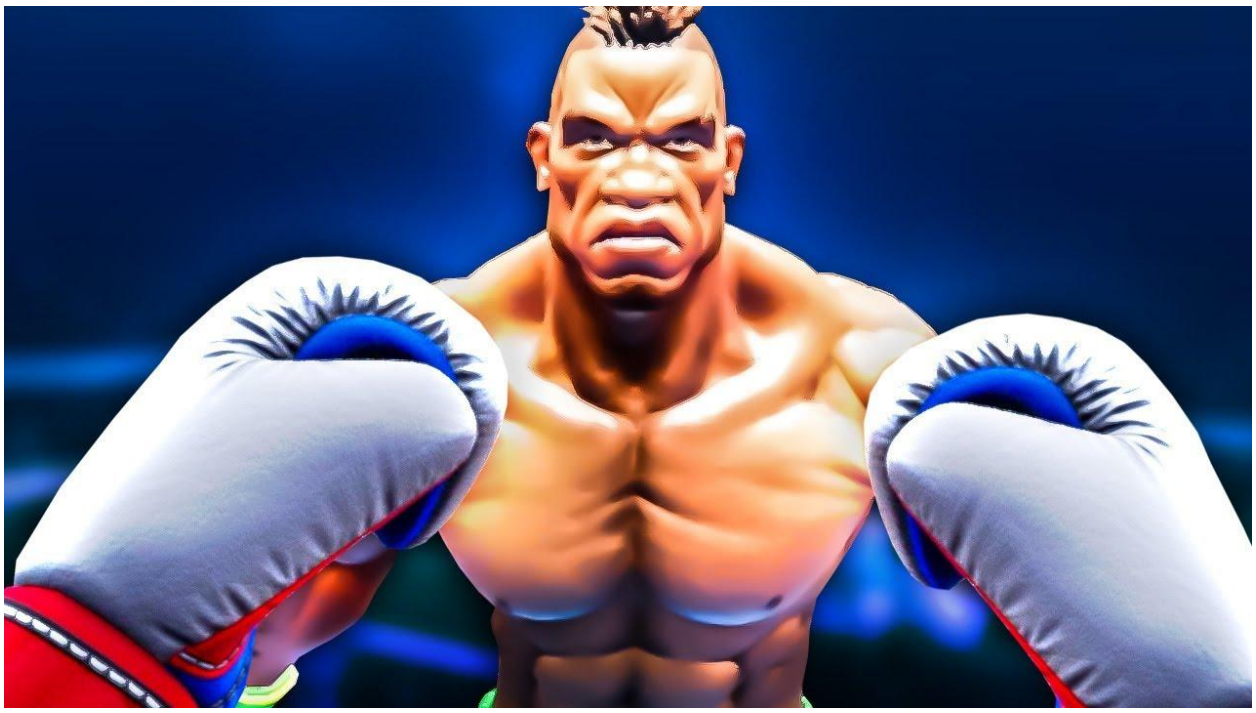
In the close-quarters of a Martian settlement, even the most harmonious relationships can be put under the pressure of prolonged contact. People should collaborate closely together, but do they need to be so close to each other in physical reality? Numerous studies have shown that in confined spaces [1] such as submarines, the international space station and remote Antarctic research bases that prolonged contact between individuals can lead to higher rates of stress and thus interpersonal conflict, and potentially wider dangerous events such as total communication and cooperation break down. Based on our own investigation into close cohabitation during a prolonged period of Working From Home in a small studio apartment in Hong Kong during the CoViD pandemic, our team believes that we have unique insight into this problem - and its potential solution.

Description of the initial solution

From our experience there were two main solutions to interpersonal problems during close confinement: to express frustrations and emotions in a physics manner, or to remove oneself from the stressor environment to calm down. We propose that virtual reality (VR) systems - comprising noise-cancelling headphones, a headset and hand-held controllers be used to provide both of these solutions listed above.

VR Goggles can be used to simulate the user's presence in environments unable to replicated on Mars.

Additionally, VR games such as Knockout League on the Oculus Quest [2] allow those pugilistically inclined to take out all their ‘excess vivaciousness’ on virtual opponents, allowing for a safe release of energy and frustration.



Take out your aggression on this mean opponent instead!

Evaluation and comparison of the solution.

Here we will compare VR escapism to other ways of solving interpersonal stress and conflict among Martian cohabitants.

Traditional conflict resolution

Traditional methods of resolving conflict between individuals often require a third-part to act as an intermediary, this can take the form of a counsellor, a therapist, a judge, or a superior. While there is a large body of work, very little can be applied to special conditions of a Martian base. The problems are peculiar to Mars, and given the small number of people at the beginning of any Martian base, the third-party is unlikely to be a disinterested actor, and may in fact be suffering from the problems of close-confinement themselves. We also think that the already-demanding requirements put upon early Martian pioneers (to be scientists, miners, explorers, historians) might be stretched upon the addition of extra-duties.

Increasing habitable area

In the long run this presents the most attractive solution. A rough benchmark is that every human being needs at least 600m^2 of habitable space (see appendix). Given that the initial Martian bases will be closer to the ISS (with a footprint estimated at 30m^2 per person), it will be a long time until a twenty-fold increase in habitable area can be achieved.

Psychological profiling

Psychological profiling can be used to reduce the incidence of interpersonal conflict and stress as is already used in the case of NASA missions and analog astronauts. However, the conditions and events on Mars will not be entirely foreseeable, and psychological profiling will not be able to be adjusted until we have sufficient data. Also, as the settlement passes into an intermediate stage between pioneers and stable, specialised and industrialised settlement, we may not be able to apply the standards so strictly. [3]

Known existing issues with VR

-They can literally make some people vomit with motion sickness [4]

- VR can cause accidental injury [5]

- VR headsets and controllers come in at a mass of around 1kg, which, when multiplied by the number of potential users can come to a significant mass.

Modifications and improvements proposed to the initial solution.

We believe that VR presents the best solution provided it comes with a wide range of games, some extra sensors for the feet to allow a proper walking experience and to allow Thai Kickboxing to be played. We also believe that the VR headsets could be used for several more purposes including education, exercise, communication and remote robot control which justifies their mass and fuel requirements.

Ideas for further development.

If we were to receive funding to develop our ideas we would like to conduct the following research:

- We would like to develop a prototype of a light-weight and compactable VR to save fuel and space on the Mars mission.
- We would like to add foot-controllers as well which facilitate proper walking and can reduce VR-induced motion sickness.

- We would like to conduct a mass research into the latest experiences of people experiencing confinement during the CoViD pandemic. Although much of this data will be of dubious quality given the difficulty in controlling and adjusting for all variables, the numbers alone may give us new insight into human psychology in close confinement.
- Using analog astronauts, we would like to develop mission-specific VR experiences that reduce stress, improve cooperation and provide escapism and relaxation in the absence of Earth's natural environment and open spaces.

Additional resources.

The following details the data used to make a back-of-the-envelope calculation about the area required for healthy human functioning. By calculating the area per person for a number of cities, we can get an estimate for the order of magnitude of space that a single person might need. This, of course, doesn't take into account the use and contents of such a space. Incidentally, it does also demonstrate the variety of urban population densities that human beings are capable of adjusting to.

The list of cities was taken from a survey of most liveable cities [6].

City	Area / km^2	Population / millions	Area per person m^2
Vienna, Austria	**414.6**	**1.9**	218.2105263
Melbourne, Australia	**9,992**	**5.078**	1967.70382
Copenhagen, Denmark	**292.5**	**0.6**	487.5
Osaka, Japan	**225**	**2.6**	86.53846154
Singapore	**728.3**	**5.6**	130.0535714
Average			578.0012759

Team biography

Alex and Ye are a great team who believe in making the world a better place. They live on a small island off the coast of Hong Kong where they spend most of their time reading, playing music and discussing the future of space. Despite coming from different ends of the world, they get on quite well and so are interested in development technologies that help foster interpersonal and intercultural communication.

We were mentored by our friend Professor Li Yang, of Chinese University Hong Kong, an expert in virtual reality [*for guidance purposes only, Prof Yang doesn't exist].*

References

[1] Effects of isolation and confinement on humans-implications for manned space explorations J. I. Pagel and A. Choukèr ,Journal of Applied Physiology 120: 1449 –1457, 2016. First published February 11, 2016; doi:10.1152/japplphysiol.00928.2015.

[2] http://www.knockoutleaguevr.com/ - a website which shows the existing state of VR experiences in an interactive fashion.

[3]Psychology of Space Exploration Contemporary Research in Historical Perspective The NASA History Series National Aeronautics and Space Administration Office of Communications History Program Office Washington, DC 2011 NASA SP-2011-4411

[4] Mitigating Visually-Induced Motion Sickness in Virtual Reality ? Jackie Becker, Thu Ngo,Stanford University, Stanford, CA 94309 USA

[5] https://www.reddit.com/r/VRtoER/ - a website which shows the great possibility for injury by the improper use of VR.

[6] The Economist Intelligence Unit's Global Liveability Index.