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Editorial

Utilization of ChatGPT-4 Technology to Enable Optimization of Astronaut Health During Planetary Missions

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1. INTRODUCTION

ChatGPT-4 (Chat Generative Pre-trained Transformer 4) is a sophisticated language model that has been created by OpenAI, is a notable advancement in the GPT series and has attracted considerable interest from the field of artificial intelligence [1, 2]. GPT-4 involves the utilization of a vast multi-modal system that can effectively process both textual and visual inputs, ultimately producing textual outputs [3]. The model is founded on transformer architecture, a deep learning framework that has demonstrated remarkable efficacy in tasks related to natural language processing [4].

2. Potential Applications in Space Medicine

GPT-4 has exhibited a level of proficiency that is comparable to that of humans in various professional and academic evaluations, indicating its potential to facilitate various tasks such as writing operative notes [5], text summarization [6], concept explanation and triaging symptoms [7]. In space medicine, GPT-4 has the potential to aid astronauts and medical practitioners through the provision of instantaneous medical data, responding to inquiries, and facilitating diagnostic and therapeutic decision making [8]. The enhanced knowledge base and problem-solving capabilities of

GPT-4 could potentially aid astronauts and medical personnel in managing diverse medical scenarios, particularly where access to medical expertise is restricted. During long-duration spaceflight (LDSF), signal delays can possibly occur [8] .

3. Testing GPT-4 in Simulated Medical Scenarios

We decided to test GPT-4's ability to respond to possible medical questions that an astronaut may have during LDSF.

3.1. Appendicitis Scenario

We first asked ChatGPT about an astronaut that believes they have appendicitis. ChatGPT correctly recommends the astronaut to immediately inform mission control about concerns and symptoms and advice is also provided on how to describe symptoms, including pain severity, location and information about any associated symptoms. ChatGPT also correctly states that further imaging tests may be required.

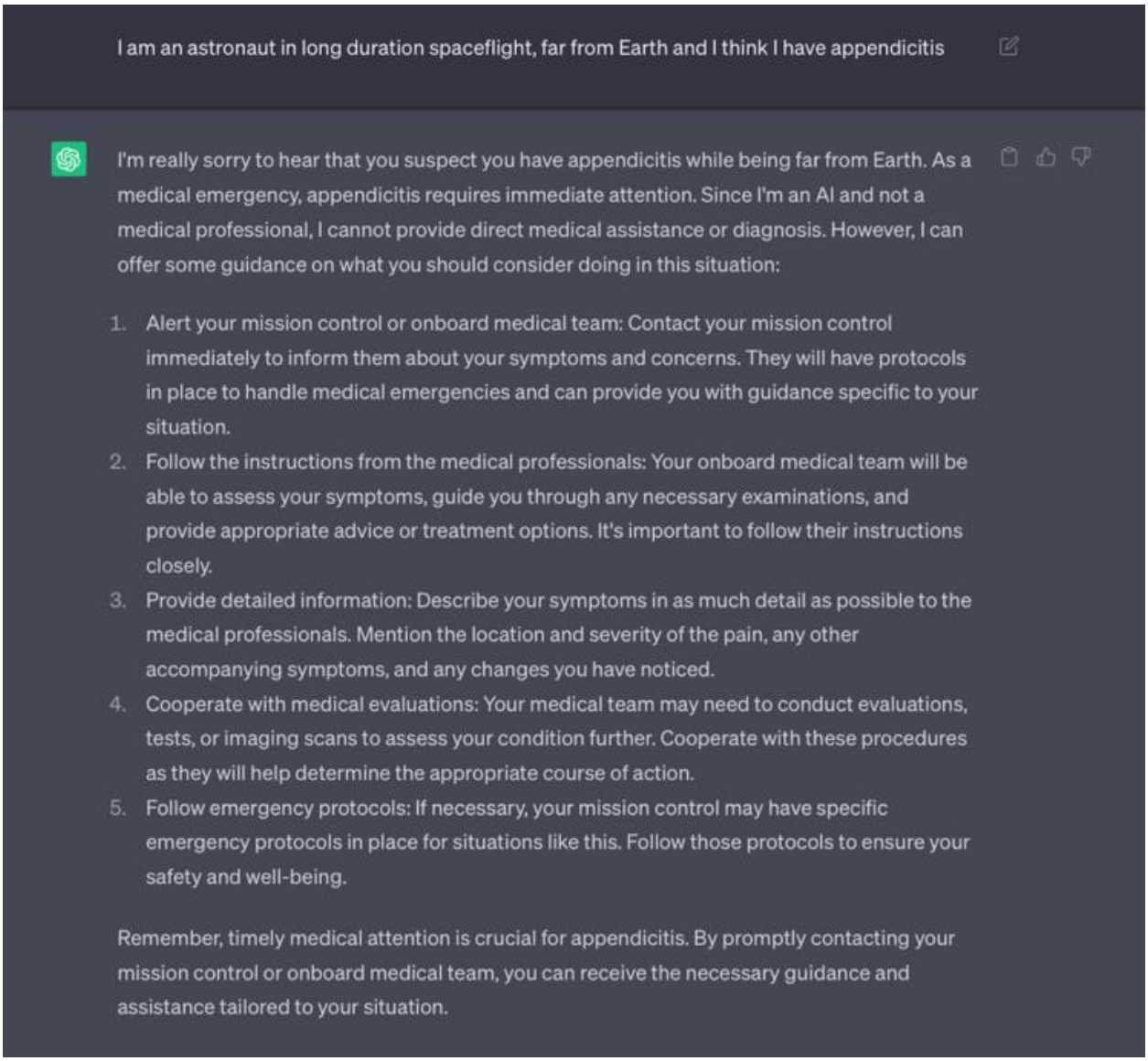

Figure 1. GPT-4 generated response from the prompt "I am an astronaut in long duration spaceflight, far from Earth and I think I have appendicitis" (Access date, January 21st 2024)

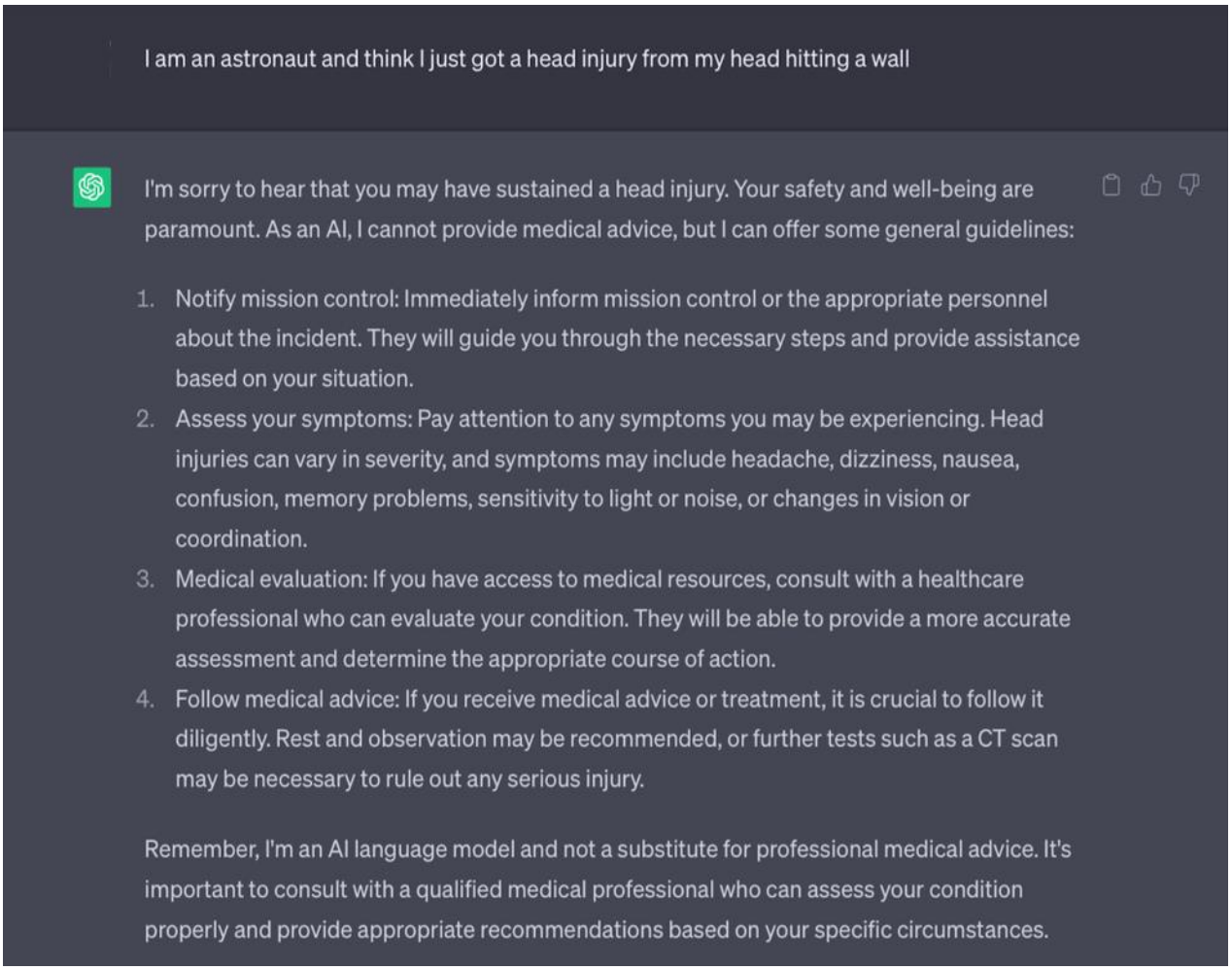

Figure 2. GPT-4 generated response from the prompt "I am an astronaut and think I just got a head injury from my head hitting a wall" (Access date, January 21st 2024).

3.2. Head Injury Scenario

We then examined ChatGPT's ability to provide advice if an astronaut sustained a blunt head injury Figure 2. The response provided included important advice such as to contact mission control, assess symptoms (such as nausea, dizziness, confusion) and to ideally consult a healthcare professional. ChatGPT also mentions that a computed tomography (CT) scan may also be necessary to rule out more serious injuries, which is accurate information.

3.3. Depression Scenario

We then asked GPT-4 what to do if an astronaut is feeling depressed Figure 3. ChatGPT gave an empathetic and helpful response, that made important suggestions such as maintaining a routine, seeking support from crewmates, and staying connected with loved ones. Impressively, ChatGPT also provided space-specific recommendations to combat depression such as keeping up with activities and news on Earth to feel more of a connection to a home planet. A recommendation was also made to communicate openly within an astronaut's support network, which includes crew members, mission control and possibly psychologists.

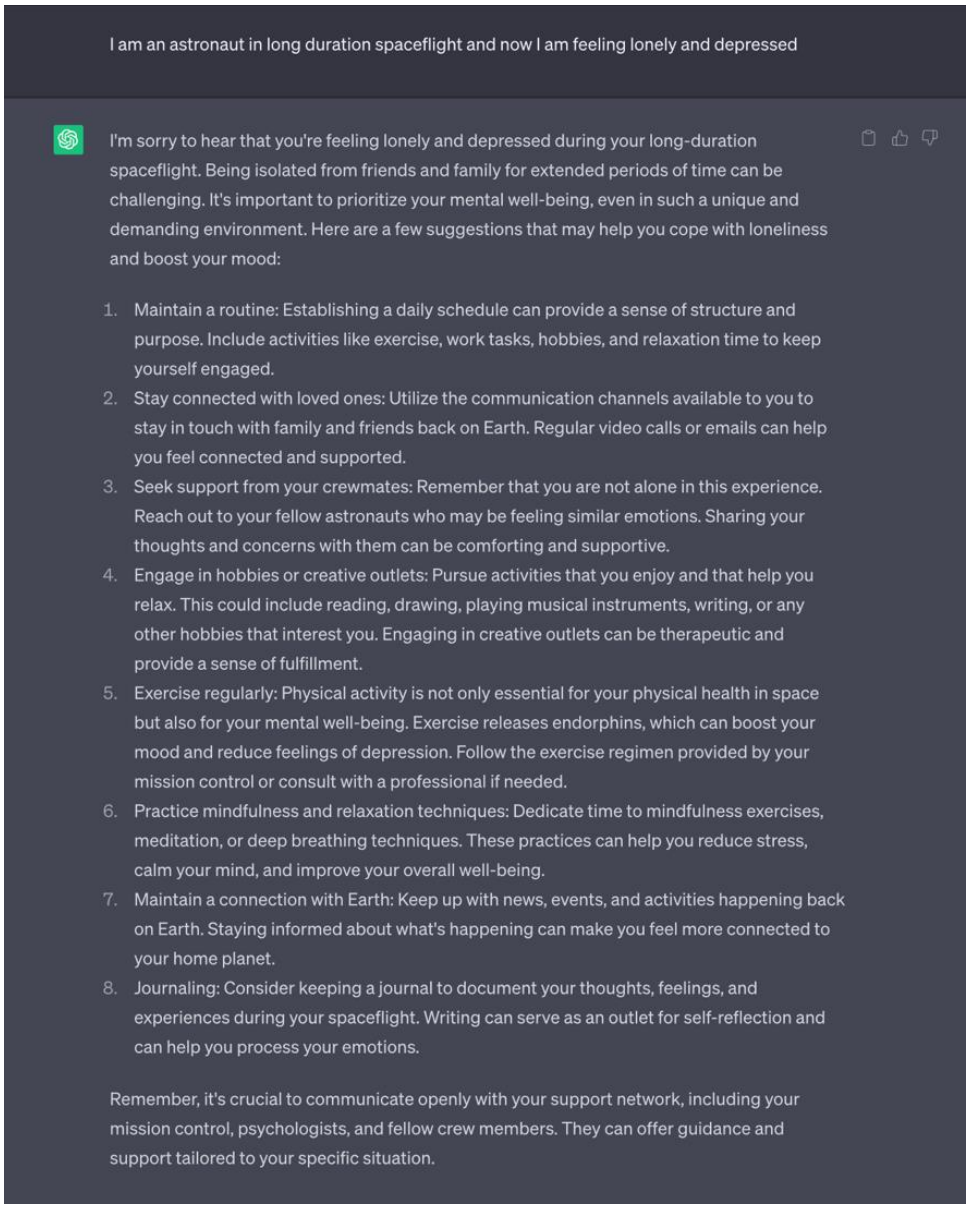

Figure 3. GPT-4 generated response from the prompt "I am an astronaut in long duration spaceflight and now I am feeling lonely and depressed" (Access date, January 21st 2024).

4. Conclusion

Some possible limitations of employing GPT-4 during spaceflight include relay of inaccurate medical information such as erroneous diagnoses or inappropriate treatment choices. Furthermore, it may encounter difficulties with contextual understanding/decision-making in this field. The field of space medicine presents distinctive obstacles that may not be adequately resolved by GPT-4 due to its potential lack of specialized expertise. This capability will likely become more reliable and accurate with future GPT models.

All in all, large language models (LLMs) such as GPT-4 are a promising technology to overcome communication delays while in LDSF. Future research is necessary to improve the responses provided by LLMs for space medicine, which can include training with specific space medicine materials.

ETHICAL APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

CONSENT FOR PUBLICATION
Not applicable.

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COMPETING INTERESTS
None.

AUTHORS' CONTRIBUTIONS
E.W. –Conceptualization, Writing
J.O. – Conceptualization, Writing
M.M – Review, Intellectual Support
N.Z.– Review, Intellectual Support
P.S. – Review, Intellectual Support
A.G.L. – Review, Intellectual Support
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