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LETTER TO THE EDITOR

# Acceleration forces can effect cardiovascular structure

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Dear Editor,

We read the article "Effect of high sustained +Gz stress on myocardial mitochondrial ultrastructure, respiratory function, and antioxidant capacity in rats" written by Chen et al. [1] with great interest. They concluded that high sustained positive acceleration had damaged cellular level of mitochondrial ultrastructure, respiratory function, and antioxidant capacity in rats.

These results are very important in researching the effects of acceleration forces on organisms, especially aviators. Thanks to the authors for their contribution.

Otherwise, the results of studies about the effects of acceleration forces on cardiovascular system in organisms and aviators might be controversial. There are a few data on the subject. Burns et al. [2] have recently demonstrated that repeated exposure to acceleration forces may lead to the formation of myocardial scar tissue in swine. On the other hand, a review of the subject by Laughlin concluded that this effect does not occur in humans [3].

In a previous study, Grossman et al. [4] investigated the effect of acceleration forces on cardiac morphologic changes in jet fighter pilots. They also assessed the exposure to acceleration forces in jet fighter pilots compared to low-performance aircraft pilots. They did find significant effects on cardiac and aortic indexes.

Furthermore, we have previously investigated the negative or positive cardiac responses to this occupational high +Gz exposure. We concluded that long-term +Gz exposure has no effects on aortic and cardiac morphologic and systolic functions, but has effects on right ventricular diastolic functions in aviators [5]. In another study, Carter et al. [6] showed that exposure to G-force and anti-G maneuvers does not appear to worsen cardiac and valve function in aviators with a bicuspid aortic valve. The effects of acceleration (+Gz) forces on the cardiovascular system has been the subject of extensive research [7, 8].

As noted in this study, the results are very exciting and promising that the +G stress negatively affects the cellular components at the level of mitochondria in rats. Similar to that, there are some studies about the effects of acceleration on the cellular level [9–12]. This study showed the acute effects of +G stress on the cardiac structure, but cumulative and chronic exposure of the G stress should be investigated for daily practice. We want to learn what the authors think about the effects of acceleration on aortic and cardiac structures.

In conclusion, the subject is very timely and we need further studies to better understand and investigate more potentially harmful effects of high +Gz stress on the human heart, and, subsequently, help to prevent heart injury.

**Conflict of interest** There is no conflict of interests.

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