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IT'S A HEART TIME - ANALYSIS OF THE EFFECTS OF HEARTBEAT AND PHYSICAL ACTIVITY ON SUBJECTIVE TIME PERCEPTION IN THE ISOLATED ENVIRONMENT OF AN ANALOGUE SPACE MISSION

Abstract

The human perception of time is a mechanism that depends on many external and internal factors and remains not fully understood. In particular, little data has been published on the relationship between heartbeat and human time perception. Recent research suggests that faster cyclical heart rhythm might increase a higher time keeping resolution. The correlation between second- to minute-like interval perception and heartbeat remains an open question, and the current research studies are not conclusive. However, this topic is particularly relevant in situations with a substantial time regime - such as in space.

In this study, we are specifically addressing the correlation of heart rate and subjective time perception in an isolated environment using a specially designed mobile software and wearable medical-grade ECG sensors. The application consisted of three modules: a passive time perception, active time perception, and subsecond time perception. The first two modules consisted of guessing the display time of a geometric shape on the device screen by entering the guessed value and holding the button for as long as the user thought the image was displayed. In the subsecond time perception module, the user's task is to compare two short tones and classify them as a long tone or a short tone. The tones are randomly generated from a range of 50 (reference short tone) to 250 ms (reference long tone).

Fifty analogue astronauts participated in the study. They all lived under the conditions of a standardised analogue space mission, eating the same food, being in the same lighting conditions and completing strictly defined activities in the mission plan. Their task was to carry out the full measurement procedure in five different activities. The first measurement was carried out in a sitting position, the second after a 5-minute walk at 5km/h, the third after a five-minute jog (8km/h), the fourth after a five-minute sprint (12km/h) and the last after simulated orthostatic hypotension. The collected data was statistically analysed, synchronised with the sensor ECG signal, and interpreted. Some differences in time perception were observed in the described scenarios.