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Dynamics of stress markers during two ground simulations of long lasting space missions

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Stress related to social/environmental confinement is a major obstacle to our capability to undertake long lasting space missions (LLSM) and, thus, selecting adequate stress-resilient crews could be a key point for the success of LLSM. The Mars105 and Mars500 projects were ground simulations of long LLSM that were designed to study psychophysiological factor alterations, such as chronic stress, due to social isolation and spatial confinement. This study aims at studying chronic stress dynamics during the isolation in the two simulations, and at suggesting criteria for identifying highly stress-resilient individuals. In both projects a crew of six members was recruited and two stress-related parameters were collected: the average concentration of urine cortisol over 24h and the score of the Perceived Stress Scale. The parameter time courses were compared between simulation at four experimental points: baseline condition, 90 days, mid isolation, and after the end. The trend of the two parameters is identical in the first part of both simulations, whereas there is a distinct difference between the final samplings of the two simulations: in Mars105, parameters had a final decreasing trend, similar to the left side of an "U" whereas in Mars500, parameters had a final rise, and the whole time course formed a whole "U". Moreover, by comparing individual trends of each Mars500 member, we can observe individual differences suggesting that volunteers with the lower increase of stress markers at the end of the simulation had a better adaptation to the confinement condition. The comparison between results of simulations indicates that only in the longer simulation the end of the isolation was perceived as a stressful event as most of the crew appeared no longer accustomed to psychological stressors of the nonisolated life. Finally, the

individual different stress levels at the end of the isolation could be useful for identifying the optimal profile of astronauts for LLSM.