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Long-Duration Exposure to Microgravity Does Not Affect Perceived Travel Distance

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One of the most common, and most complex functions of the human brain is to perceive our own motion. Estimating how far we have travelled is a multisensory process, although the relative contributions from our different sensory systems in estimating travel distance is still unknown. Testing astronauts in microgravity not only allows us to parse out the contributions from the different senses more easily, but it can also inform mission planners and trainers about how our perception of travel distance might change in microgravity. Using virtual reality, we tested astronauts' (n=12, 6 female) perceived travel distance 5 times: once before their flight, twice in space (upon arrival and 3 months after), and twice again upon return to Earth (upon reentry and 2 months after). Results show no significant difference between the astronauts' estimations of travel distance after arriving to the ISS, after 3 months in space, or when they returned to Earth. These findings not only provide insights into the sensory contributions involved in making travel distance estimates, but also indicate that there is no adverse effect of long-duration exposure to microgravity on perceived travel distance.

The role of perceived naturalness and animacy in the visual pleasantness of a bouncing event

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The present research systematically explored the relationship between perceived naturalness, perceived animacy and visual pleasantness in bouncing events. Across two experiments, observers saw a small black disk moving back and forth repeatedly along the vertical axis of the screen. The following parameters were manipulated: (a) the simulated coefficient of restitution C (0.7, 0.85, 1, 1.15, 1.3), (b) the value of simulated gravitational acceleration a (9.81, 2.45, 0.61, 0.15 m/s^2), (c) the duration of the delay at the impact (0, 30, 60 ms) and (d) the motion pattern (uniform acceleration/deceleration or constant speed). There were three tasks, performed in three blocks in counterbalanced order. Observers used a VAS (Visual Analogue Scale) to judge (1) how much the animation looked as the bounce of a physical inanimate object, (2) how much the animation looked as the jumping of a living being endowed with its own force, and (3) how much the animation was pleasant and beautiful to see. We found that (i) C is negatively correlated with perceived naturalness and positively correlated with perceived animacy; (ii) perceived naturalness is enhanced by uniform acceleration/deceleration, whereas perceived animacy is (slighly) affected by the motion pattern; (iii) although a positive correlation between visual pleasantness and perceived animacy emerged, the two concepts are mostly independent from each other. Indeed, visual pleasantness was strongly affected by motion pattern (i.e., uniform acceleration/deceleration was judged as more pleasant than uniform velocity) and it was also partially affected by temporal delay, despite the fact that these parameters had little or no influence on perceived animacy.

Electrophysiological responses of the movement-related tactile gating in blindness

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The cortex suppresses or attenuates somatosensory information during the movement generated with an action. This phenomenon is known as movement-related tactile gating, and it has been suggested to be related to the generation of the efference copy (i.e., the internal representation of our movement) that allow us to discriminate which feedback belongs to the external world and which is generated by ourselves. Although it can lead to a worse encoding of tactile information, the diminished tactile feedback can be compensated through different strategies in typical individuals. Interstingly, vision seems to impact the phenomenon, with blind individuals showing reduced tactile reliability during active touch compared to its passive form. With this work, we wanted to shed some light on this issue by studying the neurophysiological responses using EEG in the time and time-frequency domains of sighted and blind participants in a tactile velocity discrimination task. Using a physical wheel, participants were presented on one fingertip with two movements that differed in speed and were instructed to detect the faster one. The experimental conditions were: (1) passive touch, where the finger of the participant was in a fixed position, and (2) active touch, where participants moved their finger contrary to the wheel's movement. Results suggest that vision modulates the difference of event-related electrophysiological responses in sensory-motor areas between passive and active touch. Our results are in agreement with the movement-related tactile gating. For this process to be successful, motor-