Manipulation of internal physics representation through perception of unnatural physical environment

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It has been hypothesized that human cognition might rely on an internal representation of physics that guides our predictions in motor behaviour. How fast we are able to learn novel laws for physics, and more importantly whether such newly learned laws of physics can be transferred to arbitrary novel tasks. METHODS: We have designed a virtual environment where participants controlled humanoid avatar and were able to manipulate virtual ball. One-to-one mapping of participant's full-body movement to the virtual avatar was achieved real-time through VICON motion capture system and the virtual scene was presented to the participant in the form of a virtual mirror on large projection screen. The experiment consisted of ball bouncing (training) and target aiming (transfer) tasks, during which we could manipulate gravity in a position-dependent manner. The participants were split into two equal groups, where control group trained by bouncing the ball under normal gravity and the other group trained under modified gravity. Both groups performed the target aiming task in the unnatural gravity field. RESULTS: Both groups showed increased performance over time for both tasks, indicating successful task learning. We found minimal difference in performance between the two groups during the transfer task. Our results are inconsistent with learning internal representation of physics, but rather show task-specific learning.

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