
How changes in structure and function of the physical body affect body and space representation.

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Abstract

The brain contains multiple representations of the body and of the space surrounding the body, i.e. peripersonal space (PPS). We asked how much such representations are sensitive to changes in the structure and the function of the body they represent. In order to test the effects of a change in the structure of the physical body, we tested body and PPS representations in patients undergone to upper limb amputation and prostheses implantation. Amputation deformed body and PPS representation, so that patients perceived their stump as shorter and the PPS around the stump was disorganized, as compared to the intact limb. These effects can be partially reversed by prosthesis implantation, as just wearing the prosthesis extended the perceived length of the amputated limb and the representation of the space around it. In a second study, in order to test the effects of a change in the function of the physical body, we tested body and PPS representation before and after 10 hours of immobilization of the right arm, resulting in a parallel extraordinary use of the left arm. This procedure did not change the implicitly perceived length of the immobilized right arm, but did increase the perceived length of the over-used left arm. Conversely, PPS representation was reduced around the immobilized arm, but did not change around the over-used arm. These findings show that body and space representations are plastically shaped as a function of both structural and functional proprieties of the physical body.

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