Embodiment in Virtual Reality: a platform for manifold studies, from human perception to telepresence and rehabilitation.

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Virtual reality can be used to successfully induce the illusion of owning and controlling the body of a virtual avatar that substitutes the own physical body. This process has profound implications that are being investigated and unfolded in several research fields, from cognitive neuroscience to applied research such as brain-computer interface, rehabilitation and robotics.
From the cognitive neuroscience perspective, embodiment in virtual reality provides a valuable platform to manipulate bodily sensory stimuli under controlled experimental conditions, so to allow exploring the perceptual and cognitive components of own body representations in the brain. Recent studies have further extended into investigating how the feeling of ownership and agency can affect attitude and behavior when induced over a virtual body that is importantly different from the one's own physical body.
From the perspective of applied science, embodiment in virtual reality is receiving growing attention as a tool for overcoming and in some cases transcending the limitations of the physical body. Representative examples within this research stream are psychotherapeutic treatments requiring the exposure to conditions that would be hardly tolerated in physical reality, telepresence for real time interaction with machines and/or other persons in a remote location, rehabilitation and training for patients with physical and/or cognitive impairments.

The presentation will consist of two main parts. In the first I will discuss how the body ownership illusion can contribute to the current understanding of how humans perceive their own body, addressing future trends toward this direction. I will then extend the discussion to the feeling of agency over a virtual body and to the more general embodiment of extracorporeal objects, discussing their relationship with body ownership. In the second part I will present results from very recent studies that have started to explore the behavioral and attitudinal implications of owning a virtual body different from the own one. Finally, I will sketch an overview of how embodiment in virtual reality can be exploited in various applied research fields, particularly in rehabilitation and telepresence.