Designed to sense and move

Product design as a game-changer in the development of systems for sensorimotor rehabilitation after stroke

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INTRODUCTION

Design affects the way we experience the world every day: from the handle of a door to the interface of a smartphone, we experience a designed world in all our actions (Clark, 2004; Gallese, 2005; Gibson, 2014; Papanek, 1984; Rawsthorn, 2013). Technologies have become a powerful instrument to mould the human behaviour, and the development of assistive device has risen, supporting therapists and physicians to take care of patients and have become important tools into the rehabilitative experience.

STATE OF ART

The design of devices for rehabilitation requires a multidisciplinary approach, merging the last neurosciences discoveries with established therapeutic practices through the application of advanced technologies, such as robotics and VR environments, in existing environments as hospitals, Stroke Units and nursing homes. The development of medical devices has been for a long time a domain of engineering supported by physicians, but the predominance of a technical approach risks to put on a secondary level the needs of the users and beneficiaries of the systems, driving to a less satisfying experience of use and less efficient recovery.

DESIGN AS GAME-CHANGER

Product design can play a relevant role into the development of systems for sensorimotor rehabilitation after stroke by becoming a connector between the technical requirements and the users' needs, in particular translating the rehabilitative experience into a User Experience (UX) that requires to be tackled with a User Centered Design Approach – UCD (Mival & Benyon, 2015). Users become the core of the design process, and their identification allows to better define the needs, to test the interaction and therefore to finalize the technical requirements. The application of design thinking to rehabilitation aims to investigate the possibilities of development of user-friendly environments to create systems that enhance the rehabilitative experience through the use of gamification strategies, thus involving the patient into a state of flow (Csikszentmihalyi, 2009) and engagement (Gazzaley & Rosen, 2016) that results into an optimization of the rehabilitative experience.

CASE HISTORY AND TOOLS

A research for the development of a system for sensorimotor of lower limbs in bedridden patients has been conducted as part of a Doctorate in Design Sciences (Toso, 2017): the research has started from an interdisciplinary investigation through robotics and neurosciences, with the support of tools from the Design Research Methodology – DRM (Blessing & Chakrabarti, 2009) for the literature studies and from ethnographic approaches (e.g. on-field observation in a Stroke Unit and interviews), then followed by a product development where quick-sketching and rapid prototyping have been instruments for the design and the investigation of the concept development.

The result of the study is a preliminary concept for the development of a system to be used by physicians for sensorimotor rehabilitation of the lower limbs in bedridden patients, integrating teachings on rehabilitative procedures (Perfetti & Pieroni, 1992), haptic stimulation and physical interaction with virtual gaming dynamics (Calleja, 2011) to improve the patient's involvement with the rehabilitation.

CONCLUSION

As external figures with technical and humanistic background, designers can become a connector between the physician, the patient and the engineers in order to develop systems that integrates advanced technologies into the rehabilitative therapy to make it a more effective and pleasant experience.