EXOTrainer experiment review

In very brief the main objective of the ExoTrainer experiment was to improve an existing exoskeletal platform for applications on spinal muscular atrophy patients (children) and allowing three-dimensional walking in home-based and clinical scenarios.

By reading the original proposal and the final report two main concerns may arise: (1) is there any evidence of real clinical needs for exoskeletons in the treatment of the disease? (2) Isn't the developed exoskeleton too expensive for home-based applications?

Since the beginning of the review the need for exoskeleton technology in the treatment of the specific patients was motivated and supported by convincing considerations. Although the typical patient conditions were described revealing a certain knowledge of patient needs specific requirements for exoskeletons design are not always supported by a solid, quantified analysis. However, it seems that the design has been driven with a strong interaction with the clinical partner which should be appreciated.

The description of the prototype was technically sounding and detailed discussions on technical aspects has been provided during the visit at Marsi Bionics laboratory. I acknowledge that the technical staff is aware of state of the art solutions regarding all aspects of exoskeletons design including mechanics, electronics, control and application requirements. The final prototype looks very solid with high technology readiness level. The discussion with the staff was extremely interesting if not exciting. Moreover, despite the original proposal was about improving an existing platform, the final prototype has been developed from scratch. This allowed to further reduce the size of actuators and electronics and to improve the mechanical design. With respect to the previous design, the final prototype looks more captivating, compact and some mechanical issues have been solved (e.g. small slacks). From a technical point of view, the quality of achieved results can be considered even beyond the proposal expectations.

Clinical results were shown using videos and simple metrics on walking sessions showing the effectiveness of the treatment with the prototype. Even if it is not easy to understand the patient acceptance without personally assisting to training sessions the videos were quite convincing.

From the impact viewpoint, the prototype looks very near to a commercial product. It looks very safe, reliable and compact and it is already certified for medical applications. Moreover, it is designed to allow fast wearing and easy mechanical adjustments to adapt to the specific patient gait patterns. Even more important, the partners showed a detailed business analysis describing the economic impact of the proposed technology. Even if the proposed exoskeleton design is very complex (e.g. 5 d.o.f. per leg) they were able to motivate each specific technical choice.

Personally, I really enjoyed taking part at this review. I found particularly interesting to understand their viewpoint on the application. Indeed, at the beginning I was not convinced about the needs for such a complex exoskeleton especially considering the high components cost (e.g. motors and transmission systems). However the project partners were very convincing in addressing each specific concern.

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