

Development of an assistive soft exoskeleton – a multistakeholder endeavour

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Aim

Development of a soft and modular exoskeleton to assist people with mobility impairments, which incorporates the needs and requirements of future users.

Methods

Patients (primary-users), n=8

- incomplete spinal cord injury
- hemiparesis post-stroke
- age-related weakness

Caregivers (secondary-users), n=8

- professional: physiotherapists, occupational therapists, nurses
- non-professional: relatives

Procedures

- formulation of basic requirements based on use-case derived from primary-user interviews
- testing of 4 prototypes
 - primary-users: function, usability
 - secondary-users: rating of videos using questionnaires and interviews

Results

Changes achieved throughout prototype development:

Function

- ☺ notable active support
- ☺ ankle dorsiflexion & hip flexion assistance well received
- ☹ suitable for limited users
- ☹ too noisy

Design

- ☺ improved appearance
- ☹ donning/ doffing improved but still too slow and complex
- ☹ garment material potentially too warm
- ☹ backpack heavy and bulky

Conclusions

- Primary- and secondary users of a technology should be involved in the development from the very beginning.
- The choice of users and the level of involvement must be considered carefully and be adapted to the level of development.
- All stakeholders should acquire basic knowledge and perspectives of the other involved disciplines.
- Physiotherapists play a key role by bridging user-perspectives with that of engineers.

Non-Professional Caregivers

- practical aspects
- out of the box perspective
- focused on known individual case

XoSoft

Controller (backpack)

- gait phase recognition
- control of support elements
- energy supply

Support elements

- dynamic support of hip-, knee- or ankle joint

Sensors

- pressure
- motion



Patients

- honest feedback
- direct user-perspective
- individual needs
- hopes or exaggerated expectations
- heterogeneity

Engineers

- technological solutions
- safety
- focus on technical feasibility
- too sophisticated (non-practical) features

Professional Caregivers

- clinical needs and requirements
- implementation in treatment path
- technology reluctance

References

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