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Physiotherapists' Views on the Software Monitoring Application of a Wearable Assistive Glove

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Abstract. The FutureGlove project aims to further develop the CarbonHand system (a wearable assistive glove) by introducing a new software monitoring application. Within this study, we consulted five physiotherapists during online sessions to gain their views on use of data and patients' empowerment. These first insights suggested that more data needs to be collected than it is doing now to monitor the patients' progress, that therapists would like to personalize the amount of freedom they provide to their patients, and that they would like decision support for algorithms, but they do not fully trust them.

Keywords. Hand rehabilitation, patients' empowerment, trust in algorithms

1. Introduction

In FutureGlove, a project within the Eurostars Programme (project ID: 114821) the Carbonhand system is being further developed into a next generation light, wearable robotic glove for hand impaired patients. The system has a high potential to act as a therapeutic assistive device for support during active daily living (ADL) and during therapy. The Carbonhand showed improvement in grip, strength and improved hand function in clinical studies [1,2]. For more information on the CarbonHand system and the glove's settings, please refer to the website of BioServo: https://www.bioservo.com/healthcare.

A software monitoring application providing access to the patients' results is part of this new technology. These will enable the rehabilitation process while the patient has the freedom to use the device on his or her own. The development follows an iterative, user-centric approach, and ensures that the design is based on user's needs.

2. Method

Online design session interviews were conducted with five physiotherapists to acquire their insights on functionalities of the software monitoring application, specifically regarding use of data and patients' empowerment. The participants gave permission to

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be video and audio recorded, and to use their data. After transcribing the interviews, two cycles of inductive (thus whilst reading the interview) coding as described by Saldaña were performed, with a good intercoder reliability (Kappa coefficient of .82) [3].

3. Results and Discussion

According to the therapists, more data needs to be collected than the system is doing now [2], with the goal of monitoring the patients' progress. The most mentioned parameters are: glove' usage, number of grasp movements, and glove's strength the user needs to make a grip.

The power given to a patient depends on his or her cognition and technological level. Accordingly, therapists should be able to personalize the amount of freedom given to a patient. Furthermore, patients should always discuss the data with the therapist to avoid misinterpretation. However, not giving patients the full power to use the technology on their own contrasts with an emerging approach to eHealth where patient empowerment is used to promote self-management and patient independence [4]. A way for patients to use the glove more independently and empower them is to have an algorithm learning from the parameters retrieved and automatically change the glove's settings and give advice. Nevertheless, an algorithm cannot be fully trusted to do that, also because it cannot know patients' hand dysfunction. Knowing that could give more reliable suggestions, but it might still not be safe to use as there are many factors which cannot be predicted. This could harm the patient, as debated in [5].

However, as smart decision making by algorithms has high potential, could also save time for therapists, and create personalised messages for patients. Because of the benefits, it is important to make this advice trustworthy, therefor evidence-based, good quality and user-friendly presentation of data is needed [6]. Moreover, ethical considerations should be made [5].

Because of the low number of participants, general conclusions cannot be drawn. However, the results of this study lead to recommendations for the development of the first prototype of the software monitoring application of FutureGlove. Therapists and patients will be further involved during testing and the further refinement of the prototype.

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