HELP AND CARE SYSTEM FOR PROMOTING PHYSICAL ACTIVITY IN PEOPLE WITH SPINAL CORD INJURY

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1. Summary of the original project

This project aims to assess whether an intervention programme using smartphone technology helps to promote physical activity, and consequently to reduce the impact of disease, promote social participation and improve the quality of life of a sample of patients with spinal cord injury. This intervention programme has been created by a multidisciplinary team of rehabilitation doctors specialising in spinal cord injury, specialists in physical exercise and adapted sport, and computer engineers. To this end, we started with a number of 50 patients with paraplegia, randomising the individuals into the control group and the intervention group. Measurements have been taken pre-post intervention and mid-intervention (pretest2). Strength (isokinetic dynamometer) and flexibility (electrogoniometer), cardiovascular status (cardiac stress test and 2D cardiac ultrasound) and lung function (spirometry) were assessed. A panel of experts also determined the most relevant medical variables to be analysed. Finally, a series of questionnaires were administered to assess quality of life (A-QoL), anxiety (HADS), functionality (SCIM-III) and resilience (RS-25). It was observed that patients in the intervention group had better cardiovascular health and lung function, greater elasticity and strength, and better quality of life and function than those in the control group. If this is the case, it could suggest the effectiveness of the intervention programme promoting physical activity using smartphone technology.

2. Summary of the results obtained

This project aims to assess whether an intervention programme using smartphone technology helps to promote physical activity, and consequently to reduce the impact of the disease, promote social participation and improve the quality of life of a sample of patients with spinal cord injury. It has created an mHealth with a high qualification in usability for its own users, which did not exist before, and which can be used as a basis for developing technology that promotes physical exercise in a wider population of people with functional diversity. It has been discovered that physical exercise implemented at home by an mHealth has allowed the volunteers of the study not to suffer a physical deterioration leading to functional and quality of life impairment, as would be expected from the confinement and lack of socialisation caused by the COVID-19 pandemic. It means that it is now possible to promote physical exercise in

patients regardless of the existing social conditions. This is a great and innovative novelty, clearly beneficial for the population of people with spinal cord injury.

3. Relevance and possible clinical implications of the final results obtained

It is expected that the results of this research project will have a wide-ranging impact in the clinical, economic and social spheres. Firstly, specific knowledge has been generated about the impact of physical activity on this population. This knowledge will lead to an improvement in the prevention of the comorbidities associated with this pathology and, consequently, to a reduction in the related annual costs per person, which are approximately $43,000 (New and Jackson. 2010;35(7):796-802).

On the other hand, objective and scientific criteria have been generated for the recommendation of guidelines for the practice of physical activity according to the individual needs of each subject. The subjects were assessed beforehand by a medical professional during their regular visits to the hospital or independently through the technological development of the mobile phone app.

Significant technological advances have also been made thanks to the development of a programme that, together with a previously validated accelerometer, allows the integration of the assessments carried out and the healthy habits guidelines offered. In addition, a server has been used to store the results, both at clinical and home level, in order to feed the initial database and allow for more extensive epidemiological studies to be carried out in the future. An open-access web portal associated with the project and the results of the database will be created for health professionals and users.

The results of this project are clearly transferable to society. In the short term, both the knowledge obtained from the epidemiological study and the technological application developed will be transferred so that they can be applied to patients in other centres of the Catalan health system through a pilot study.

Furthermore, this technology could be present in the daily life of users because the technological development of the mobile phones will include a user manual available from the moment the application is downloaded to the mobile phone.

4. Publications, communications and training of individuals arising from this research

Publications

Adrià Marco Ahulló; Lluïsa Montesinos Magraner; Luis Millán González; Jose Morales; José Antonio Bernabéu García; Xavier García Massó. Impact of COVID-19 on the self-reported physical activity of people with complete thoracic spinal cord injury full-time manual wheelchair users. Journal of Spinal Cord Medicine. Taylor & Francis, 2021.

Adrià Marco Ahulló; Lluïsa Montesinos Magraner; Luis Millán González; Roberto Llorens; Xurxo Segura Navarro; Xavier García Massó. Validation of Using Smartphone Built-In Accelerometers to Estimate the Active Energy Expenditures of Full-Time Manual Wheelchair Users with Spinal Cord Injury. Sensors. 21 - 4, MDPI, 2021.

Oral and written communications

59th International Spinal Cord Society annual scientific meeting. ISCOS 2020. Yokohama, Japan.

- Correlation between the Spanish version of PASIPD and functional capacity variables in paraplegic population.
- Promoting physical activity in spinal cord injured population: ParaSportApp.
- Scientific analysis of the literature around spinal cord injury based on text mining.

XXXVII National Congress of Paraplegia. SEP 2020. Zaragoza, Aragon, Spain

- An mHealth against physical inactivity caused by the onset of COVID-19 in people with spinal cord injury: ParaSportApp.

57th Congress of the Spanish Society of Rehabilitation and Physical Medicine. SERMEF 2019. Seville, Andalusia, Spain.

- Design of an app to increase physical activity in sedentary people with complete spinal cord injury.

XXXVI National Congress of Paraplegia. SEP 2019. A Coruña, Galicia, Spain

- Can the height of complete spinal cord injury predict anxiety-depression levels in patients with complete spinal cord injury?
- Strength and functional independence in people with complete spinal cord injury.

Doctoral Thesis

Title: USE OF SMART PHONES FOR THE MEASUREMENT AND PROMOTION OF PHYSICAL ACTIVITY IN PEOPLE WITH MEDULLAR INJURY.

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