1. PUBLISHABLE SUMMARY

Summary of the context and overall objectives of the project (For the final period, include the conclusions of the action)

Bioservo Technologies AB has developed soft robotic gloves that can add extra strength to the grip since 2006. The technology is based on voluntary contractions/movements of the user. The iHand gloves incorporates intelligent intention detection and actuation algorithms in order to adapt the level of support. The iHand gloves can be used for rehabilitative, assistive and preventive purposes.

Demographic ageing is one of the most serious challenges Europe is facing as it raises concerns for the financial sustainability of healthcare systems. The incidence of sarcopenia (muscle weakness), cardiovascular diseases and hand mobility impairing diseases such as osteoarthritis and rheumatoid arthritis increases with age. The purpose of using the iHand rehabilitation glove is to enable a short rehabilitation period for people who suffer from various impairments in the wrist/hand. The usage of this glove enables people to rehabilitate in their home-environment and to perform activities of daily living. The iHand rehabilitation glove promotes self-management of health and provides people with the opportunity to live independently. This contributes to the quality of life for people and reduces the cost of health care services.

The World Health Organization has defined a work-related disorder as one that results from a number of factors and where the work environment and the performance of the work contribute to the causation of the disease. According to the Fit For Work Europe Coalition, musculoskeletal disorders are the leading cause of sickness absence across the EU with 44M workers suffering generating €240bn annually in lost productivity and sickness absence. Thirty percent of all musculoskeletal disorders are related to muscle-, or joint pain in the wrist/hand. The purpose of the iHand assist & prevent glove is to prevent musculoskeletal disorders induced or aggravated by work and the circumstances of its performance. Approximately 15M of European workers could benefit from using this glove. The iHand assist & prevent glove could additionally be of support for people already suffering from chronic musculoskeletal disorders in the upper limbs. A healthy work force is a prerequisite for productivity in both social and economic terms for businesses as well as for the society as a whole.

Work performed from the beginning of the project to the end of the period covered by the report and main results achieved so far (For the final period please include an overview of the results and their exploitation and dissemination)

The project started with identifying the high-level requirements of the two different systems based on experience from previous research projects and initial trials with real users (WP1). Significant development of software and hardware was done with focus on usability, comfort, product cost, performance and producibility (WP2, WP3). A cloud-based data collection system was developed (WP3). Initial service models were developed (WP1) together with an initial exploitation plan (WP6). User trials for both the assist/prevent and rehabilitation use case were prepared and will start within short (WP4). A dissemination plan was created, and a number of key disseminations activated were performed (WP5). Certification strategies for the assist/prevent and rehabilitation use cases were developed and a first product resulting from the project was tested according to relevant safety standards and CE-marked (WP6). Cooperation has been initiated with an external manufacturing partner to enable production scale-up (WP6). A highlight is that a first product has been launched as a result of the project – Ironhand, the world's first soft robotic muscle strengthening system. Ironhand strengthens the worker's grip and supports potential lack of endurance to support ergonomically challenging work situations.

Progress beyond the state of the art, expected results until the end of the project and potential impacts (including the socio-economic impact and the wider societal implications of the project so far)

This project goes beyond the state-of-the-art devices by using an intention detection logic that activates the support if the user initiates the movement by a natural and intuitive movement intention. The devices have actuators that can respond immediately and in a natural way in order to facilitate the intended movement. Specific algorithms have been improved so that the force provided by the actuators doesn't replace the natural force by the user but complementing it.

Optimization of mechatronics has been made which involves reducing the size, weight and number of components of the system. This contributes to lower production costs for the company and improves the usability of the system. By reducing the size of the unit, the product is more comfortable to wear. Multiple improvements have been made with the aim to improve the product from an ergonomic aspect.

The socio-economic impact of the usage of this technology can be significant. With the possibility for patients for rehabilitation in a shorter amount of time, in their home environment, the number of resources needed for these patients will be reduced. This provides a possibility to allocate resources within the healthcare system in another way. Companies actively preventing musculoskeletal disorders will decrease the number of sickness absence for employees. These companies will not have a loss of productivity, revenue or profitability.

The further development of these products relates to 2 of the 17 Sustainable Development Goals defined by the UN, number 10. Reduce Inequalities and number 5. Gender Equality. The usage of the Ironhand product will help bridge the gap of the individual's physical capacity. The development of these products will result in a more equal workplace and society.

Address (URL) of the project's public website

www.ihandproject.eu

HSE Summit 13-15 March 2019



ExoBelin Trade show 23-24 Oct 2018





WearRAcon 26-28 March 2019



EWTS Conference - 9-11 Oct 2018





Customer Visit Germany February 2019

