

Creating a foundation for the empowerment of active older adults with the help of digital healthcare interventions for back-pain management

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Evidence-based practice showed that empowering people with digital health devices is exceedingly important and the recent pandemic has just catalyzed this tendency. Hereby, we are interested to see how using health devices could improve people's healthy behavior and help specialists to tailor a better and more personalized intervention for back-pain management. We performed end-user testing and the results are focused on the acceptance of the monitoring system. Conclusions reflect how wearing a device to detect the correctness of one's physical activity (e.g., hard manual working, lifting weights, twisting, etc.) is connected to the worker's ability to see the effects of physical activity, as a way to improve their lifting habits and prevent back-pain at work. This is a perceived benefit with an impact on user acceptance and adoption intention. The results could be used to scale-up the product, including a video-based application to reflect the feedback. Our purpose is directed towards aiding current and future generations to engage in healthy behaviors and encourage preventive care, also emphasizing the potential of device usage to detect or prevent medical risks before they cause health problems. The real "touchstone" for healthcare professionals and researchers is to help people understand and improve their unsafe behaviors (in this case, unsafe lifting) before pain or injury occurs. Only after having done so, the smart solutions can be used as powerful tools for better health at the workplace.

Additional Keywords and Phrases: digital healthcare, active older adults, user acceptance, back-pain management

1. A RISE IN THE USAGE OF DIGITAL HEALTHCARE INTERVENTIONS

In the era of digital revolution, the adoption and proliferation of digital computers and devices revolutionized work practices in healthcare and invented new ways to manage our health. Digital healthcare is all about the intersection of healthcare and technology. When health devices and products were put on the market, these have had real benefits because they became a useful tool that could empower people like future consumers to make better-informed decisions about their own health and facilitate prevention, early diagnosis and management of chronic conditions. From using mobile medical apps, wearable devices, telehealth or telemedicine, to artificial intelligence and machine learning, they all have huge potential to prevent disease while helping patients monitor and manage chronic conditions. They can also improve our capability to personalize medical intervention to each individual patient. Healthcare professionals can also benefit from the current progresses in digital healthcare.

The COVID-19 pandemic has been a catalyst for using digital health solutions in everyday activities and much more employees rely on modern devices for learning how to self-manage their needs and chronic pain and related mental health issues. It has helped ease the burden of in-person clinical care throughout the pandemic. "While it has demonstrated success in scaling itself into current care paradigms, much is still to be done legislatively, from a health

equity standpoint, and in solidifying the vision of how it will be leveraged in the healthcare delivery system of the future” (cit. Rosner, collab, 2020).

1.1 Understanding the user's motivations

From economical perspective, using wearable devices at the workplace has become an up-to-date practice and cost-effective measure that a modern organization can implement.

From employee’s perspective, motivation is the energy that directs their behavior [Rodgers, 2009]. There are two main determinants; negative motivation and positive motivation. Respectively, negative motivation can be a form of avoiding unpleasant consequences, such as pain, hurtful criticism or judgement. Positive motivation comes from a will for growth, development or just because it brings us joy. Could involving digital devices in our day-to-day lives be beneficial to the equilibrium between avoidance or personal achievement? From our previous experience, we have confirmed that deeply understanding the needs and experiences of the users is absolutely necessary before designing and developing any technological solution dedicated to the target population.

Tracking individual behaviors, preferences, motivational profiles to create a “behavioral phenotype” can be used to tailor digital health interventions such as exercise programs [Chen S., Patel M, 2020]. Researchers showed that a “one-size-fits-all” approach will not work for all patients. Visual feedback may facilitate movement retraining... videos are useful tools to help patients understand their symptoms, how they may learn to control their movement, and provide convincing evidence [Nielsen G., 2016]. This contributes to a better personalized experience.

2. DIGITAL HEALTHCARE INTERVENTIONS: USER EXPERIENCE

Here, we contribute to the development of a smart insole technology that notifies the older workers about problematic lifting and the risk of developing back pain. This facilitates receiving feedback and avoiding problematic situations, monitors people's progress and helps the rehabilitation after the onset of back pain, to finally keep the workers in a state of health and preserve their ability to work.

The device was developed during the “Smart Insole system for older workers to reduce back pain” project, part of Active Assisted Living Programme, aiming to develop a personalized smart insole system to reduce back pain caused by lifting too much or using incorrect lifting postures. The system consists of an insole that can measure lifting workloads. Data is sent to a server and that makes it possible for the user to visually see details about the correctness of their lifting. We want to see how the system performs in real-life work environments.

3. RESEARCH METHODOLOGY

Qualitative research with a small number of healthcare professionals is focused on gathering in-depth insights and validating the research hypothesis while authorizing the entire system operating in real-time. Finally, we evaluated the potential to encourage people to avoid problematic situations. Ethical considerations are mandatory.

Research question is three-fold. From the end-user perspective, do they experience improvements on their way of lifting, while using the system? From a clinical point of view, the hypothesis is this: The solution (smart insole system) empowers the users to correct or avoid problematic situations (lifting, carrying and shifting the workloads) and reduces the risk of

developing back pain. From a technical point of view, the conclusions are valuable to develop the artificial intelligence algorithm and validate how it transmits significant data to users, as well as the development of the application that provides the user interface (information, notifications, recommendations).

Target group. Instead of filtering by personal characteristics (age, gender, IT understanding/skills) we choose to include people who are still working or who have experience in the medical field, because we are interested in collecting valuable feedback to help us scale-up the product. So, a selected group of 5 healthcare professionals used the system and gave us feedback about their experience on a daily basis while providing home health-care services.

Main results. Change refers to the potential to correct or adjust people's personal habits (here, the way of lifting, carrying and moving heavy workloads). We consider that using digital devices is beneficial to foster a healthier behavior and safe compartments at workplace. This can be done by correcting the way of lifting which is based on two steps: first, the motivation to change and second, carrying out the right steps of recommended lifting technique, which are equally important to achieve the goal.

People are willing to use a device (i.e., smart insole system) to correct their lifting, because they are aware that wearing the smart insole system will be beneficial to prevent the appearance of back pain. All participants are confident that wearing the system could be a powerful tool for helping them change their lifting habits after receiving feedback from the incorporated application. Here, we emphasize the importance of receiving visual feedback from the application.

Of course, transformation happens gradually and failure is a part of the process, but people are willing to accept a positive and conscious attitude to changing a behavior that is harmful to their health. All results could be used to scale-up the product, including a video-based application to better reflect the people's effort.

4. CONCLUSION

We wanted to see if using a digital device (smart insole system) is beneficial to empower the active older adults to improve their lifting habits. We inquire about the potential to reduce the risk of developing back pains by avoiding problematic situations when performing physical activities (lifting, caring and shifting the workloads). Finally, we are confident that implementing such a system for monitoring physical activity and receiving visual feedback is beneficial to correct the way of lifting and may lead to reducing back pain, in the long-term. We intend to gain knowledge about the factors driving safe-lifting habit, such as motivation factors. The real "touchstone" for healthcare professionals and researchers is to make people change their (unsafe) lifting behavior before the back pain occurs and to influence them to correct the lifting position and take care of their health at their workplaces.

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