



Assistive technologies to enhance quality of life of older people

Lead Research Institution: Wakayama Medical University

Principal Investigator (PI): Dr Fumihiko Tajima, Professor, Department of Rehabilitation Medicine

Budget: US\$ 100,000

Algorithm development, participants recruitment, data collection: February - December 2018; Data analysis: October 2018 - January 2019; Presentation for academic conference, paper submission for peer-reviewed journal: February 2019

• Background

Sustained activities of daily living (ADL) and quality of life (QOL) are vital issues for the older people. New technology that assists in the maintenance and improvement of physical functions is desired to achieve this goal. Falls (as a consequence of sarcopenia) are one of the most well-known factors that compromise ADL and QOL of older persons. This research project will contribute to the development of a new strategy that maintains or improves ADL and QOL by utilizing several new assistive technologies to identify and reduce the risk of sarcopenia and falls.

• Research objectives and methodology

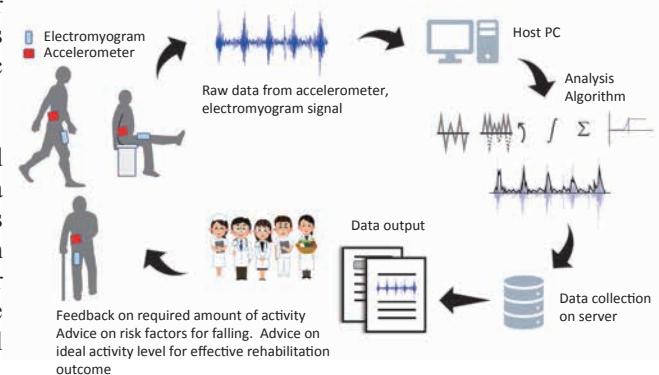
The research consists of three parts.

Part I (led by Wakayama Medical University): A new algorithm to assess the amount of physical activity from electromyogram (EMG) signals of the femoral muscles will be developed from a pilot study involving 20 healthy volunteers over 20 years old. The developed algorithm will be applied to 20 inpatients over 65 years to assess the minimum amount of physical activity required to maintain ADL and walking function.

Part II (led by Osaka Medical College): Using a newly developed wearable accelerometer, 50 healthy people over 65 years old will be monitored for fall and accelerated motions in their daily life. The patterns of their falls and associated motions will be analysed to identify the risks of specific physical activities or postures that affect the frequency of falls.

Part III (led by Nara Medical University): 20 adult patients over 20 years old undergoing rehabilitation therapy for 6 different types of conditions at a university hospital will be monitored for their physical activities over 7 days from the starting date of inpatient rehabilitation using a wearable device with acceleration sensors. The activity levels of the patients will be stratified for the type of disease along with the disease progression and clinical outcome of the patients. The data will be utilized as a baseline to define the ideal activity level of inpatients for better outcomes of rehabilitation therapy.

Assistive Technology Cycle Development Image



• Expected outcomes

1. A simple, new algorithm to assess physical activities from EMG signals of the femoral muscles that can be applied for broader use.
2. Fundamental information on the minimum amount of physical activity required to maintain the ADL of patients, which will be utilized to improve QOL.
3. Fundamental information on the relationship between specific postures and physical activities that affect the frequency of falls, which will contribute to fall prevention.
4. Baseline data about activity levels of patients and clinical outcomes to estimate ideal activity levels for better outcomes of rehabilitation therapy.
5. Through all three parts of the study, a new remote data collection system that can monitor physical activities and provide timely and effective advice to prevent falls and improve ADL and QOL.

• Team members

Lead Institution: Wakayama Medical University

Fumihiko Tajima (PI), Professor, Department of Rehabilitation Medicine

Yoshiichiro Kamijo, Associate Professor, Department of Rehabilitation Medicine

Osaka Medical College

Ryuichi Saura, Director and Professor, Department of Physical and Rehabilitation Medicine, Division of Comprehensive Medicine

Nara Medical University

Akira Kido, Professor and Director, Department of Rehabilitation Medicine, Nara Medical University Hospital

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Yasuo Mikami, Clinical Professor, Department of Rehabilitation Medicine, Graduate School of Medical Sciences

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Kanji Fukuda, Director and Professor, Department of Rehabilitation Medicine, Faculty of Medicine