

## Evaluation of the walking ability by measuring the leg function with the motivative exercise devise

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### SUMMARY

It is important to evaluate walking ability quantitatively in order to solve the problem of extended nursing dependency in the elderly community. Efficient rehabilitation can be made possible and a care worker's burden can be reduced. In our study, we measure the movable range and speed of the legs in motivative exercise and extract parameters that are related to walking ability. Moreover, we measure muscle function of the leg with an electromyogram and consider a relationship between muscle function and walking ability.

### METHOD

We target two movements in the experiment. They are (i) forward and back movement of the legs which involves stretching and flexion of the knee joint, plantar flexion and dorsiflexion of the ankle joint in a seated position and (ii) movement which repeats plantar flexion and dorsiflexion of the ankle joint. The motions are shown in Fig. 1.

Measurement items are (i) time-series data of the displacement of the legs and (ii) time-series data of the angle of the legs to the level surface. Moreover, we measure the surface myogenic potential of the legs in order to observe the muscular activity by movement. The muscles to which we measure myogenic potential are rectus femoris, vastus lateralis, gastrocnemius, and tibialis anterior. The main functions of each muscle are shown in Table 1.

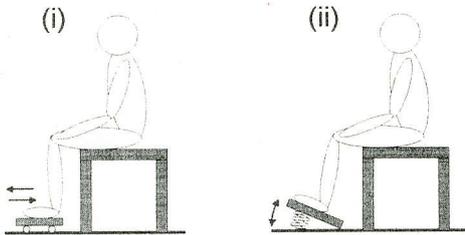


Fig.1 Operation of movement

Table 1 Muscular function

name	function
rectus femoris	stretching of knee joint
vastus lateralis	stretching of knee joint
gastrocnemius	plantar flexion of ankle joint, flexion of knee joint
tibialis anterior	dorsal flexion and inversion of ankle joint

The example of the data obtained in an experiment is shown in Fig.2. An example of the muscular activity under movement, measured by the electromyogram of gastrocnemius and tibialis anterior is shown below.

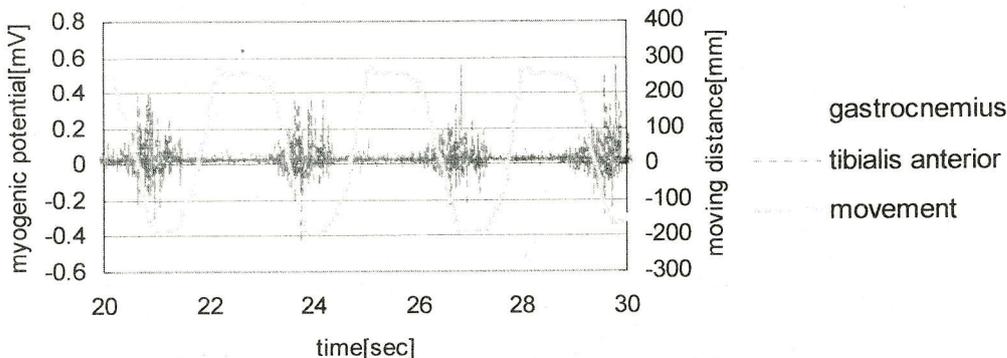


Fig.2 Movement of the legs and myogenic potential

Parameters can be obtained from the inclusion of movement and the results of the electromyogram. Finally, we evaluate walking ability based on the obtained parameters.