

## Wheelchair seat improvement for hemiplegic patients

No. 2181248 Masaru Tatsuno

(Supervised by Prof. Masaya Watada)

### **ABSTRACT**

The number of people with physical disabilities, which has been increasing in recent years, accounts for 45% of the total number of people with physical disabilities. Cerebrovascular accidents, the main disease of the physically disabled, can cause hemiplegia as an aftereffect. Hemiplegia has symptoms such as sensory disturbance and loss of motor skills in the right or left hemisphere of the body, and spasticity. In this study, we focused on a non-powered wheelchair with the expectation of suppressing muscle weakness and aimed to create an optimal seat for hemiplegic patients and to improve their ability to drive themselves.

One-handed, one-legged running for hemiplegics is not originally intended for a wheelchair, it cannot be the main method of running due to the small range of motion of the legs. Therefore, it is necessary to improve the performance of foot-driven running in wheelchairs. To solve these problems, we believe that the cutout on the healthy side will improve the running performance and expand the range of motion. In addition, the lower half of the body can be held in place by installing a sloping section on the affected side. The purpose of the cutout on the healthy side is to expand the range of motion of the leg on the healthy side, which is mainly used by the hemiplegic patient when he/she runs by him/herself. The inclined part was sloped about 9 degrees to fill the gap left when the patient sits on the wheelchair. In order to measure running performance and cadence in individual movements, evaluation was conducted using a seat with and without a cutout and a seat with and without an incline.

Based on the Wheelchair Skills Test (WST), a course of forward/backward, turning in place, and turning movements were set up, and running speed and the number of foot paddles were measured, and then the cadence was calculated. The results showed that the seat (A) tended to have a higher cadence in the forward motion, and thus, the seat (A) was effective in expanding the range of motion. In the turning operation, there was little difference in cadence between the left and right directions and between the seats, suggesting that there was little effect of the legs and much change in operation by the arms. In addition, the range of motion of the thigh was measured using a geomagnetic acceleration 6-axis sensor, and differences were observed between the seats with and without clipping.

As a result of this study, a functional tester was created to improve the seat of a wheelchair for hemiplegic patients. Each movement indicated that the seat with/without a cutout and with an incline was the most effective.