T. Ando, M. Nihei, M.G. Fujie. Design and evaluation of an amplified walking system for elderly people. Gerontechnology 2008; 7(2):69. Of all the developed counties, Japan has the most aged society (21.5% of the total population). Therefore, the importance of support systems for elderly Japanese people will increase in the future. A new walking-aid system called 'Tread Walk 1 (TW 1)' (*Figure 1*) has been developed. The first phase of the development was aimed at proofing of the concept that the system can enable elderly people to move around comfortably on their own, without stressing their physical condition or health[1] The second phase focused on a DC motor that controls the velocity of the belt by sensing walking motions and adjusting the belt speed to match the speed of the user as he walks naturally on the belt[2]. We later developed a second DC motor system that controls the velocity of the TW driving wheel, so that it is amplified by a predetermined factor in relation to the walking speed of the user. In this paper we focus both on further design of the TW, which was based on the body features of elderly people, and on the evaluations of the TW, which involved both young and elderly subjects to develop a highly safe and easily manoeuvrable TW system for elderly people. **Design methods** The characteristics of body size and shape depend on race, sex, and age. In this research, the target group was formed by elderly Japanese people. Based on the information from the Human Body Properties Database (Digital Human Research Center, AIST), the wheel-driving mechanism, the steering mechanism, and the walking belt were designed. The design items included the following: mounting and dismounting motions, driving wheel mechanism, load capacity, usage time, handle length, grip radius, handling force, belt length, and height of the walking surface. In addition, after surveying the risk factors in the use of powered wheelchairs such as body shifting and body tilt, we extrapolated the risks that users of the TW might face and created specifications for a system that minimized these risks. **Evaluation** Two evaluation experiments were conducted, both of which called for the subjects to drive straight for 10 meters in an open, flat area, with two amplification factors (driving wheel speed/walking speed), of 1.2 and 1.5 respectively. The first was a basic function evaluation that involved 10 healthy young people. In this evaluation, six specific items, for instance, "Could you walk naturally as if you were walking on flat ground?", were investigated in seven stages, and the general feeling in regard to controlling the TW also was determined. The result of this evaluation was that overall the development requirements had been satisfied, but that there still were some items that had to be improved, such as treadmill control and the relation between the height and posture of the user and the position of the steering handle. After improvement of these items, a test-driving evaluation that involved three healthy elderly people was conducted. The evaluation showed that there was a good match between the TW system and the physical characteristics of the elderly users. This means that the TW system provides safe mobility for elderly people and allows them to expand their travel distance without increasing their actual walking speed.

References

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Keywords: new mobility, walking, design, exercise
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Figure1 Tread Walk 1 (TW 1) [1]