Design and construction of a sit-to-stand support device for the elderly

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Abstract

Home-bound elderly people are those who can get around by themselves at home or may need some help from a caregiver. A cane or walker is often used to provide support for activities in the home. The sit-to-stand movement from a bed to a walker or from a chair to a walker can be difficult for the elderly due to loss of skeletal muscle mass and reduction of muscle strength and function. The objective of this study was to design and construct a support device for the elderly to help them stand-up while transferring from a chair or bed to a walker in order to reduce the muscular exertion that may cause muscle injury or increase the risk of falling. The design idea was to use a controllable triangular air cushion for lifting and lowering the subject. This study adopted the biomechanical analysis of sit-to-stand and air-compression control. This design of the stand up and sit down support device for the elderly consists of two main parts: hardware and software. The hardware comprises the user interface, the control unit, and the display unit. The software was developed with a microcontroller with C programming language. Using Kinovea software to evaluate the functional test, it was found that the designed device can perform the sit-to-stand biomechanics phase from phase I to the middle of phase III. The performance test showed that the time duration, when measuring from the start until the maximum pressure of the triangular air cushion was reached, was approximately 1 minute. The electrical safety test results revealed a 20 µA leakage current, which met the IEC standard of 60601-1.

Keywords**:** *assist device; biomechanics; design and construction; elderly; sit-to-stand; support device.*

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