

Sit-to-Stand from a Rocking Chair and a Fixed Chair: Kinematics and Kinetics

Taigo Yamada¹, Hiroyuki Iso¹, Tetsu Yamada¹, Takeshi Kamishima², Hiroshi Ando³

¹Hyogo University of Health Sciences, Chuo-ku, Kobe City, Japan, ²Osaka Kawasaki Rehabilitation University, Kaizuka City, Japan, ³Kobe University Graduate school of Health Sciences, Kobe City, Japan

Introduction: Standing from a fixed chair is a common activity that is performed many times during the course of a day. We investigated how the lower extremities and torso contribute to sit-to-stand movement pattern from a rocking chair. **Objectives:** We wanted to see what kinematic and kinetic characteristics were involved in the sit-to-stand movement pattern from a rocking chair versus a fixed chair in terms of lower extremity and torso movement patterns. **Methods:** We recorded the activity with high speed video and force plates. The subjects were 6 healthy university students whose mean age was 18.9 ± 0.4 years, mean height was 1.628 ± 0.127 m and mean weight was 56.6 ± 12.4 kg. Among these subjects, three males had heights of 1.737 ± 0.017 m, weights of 66.7 ± 6.5 kg, while three females had heights of 1.518 ± 0.064 m, weights 46.3 ± 5.7 kg. Subjects were instructed to perform two tasks: sit-to-stand from a fixed chair and sit-to-stand from a rocking chair (ICHIBA Co., LTD, Japan). In both tasks, the starting position was set with the knee flexed at 90 degrees and the feet shoulder-width apart. Kinematic data during sit-to-stand movements were recorded with an optical motion capture system (Vicon, Vicon MX) at a sampling frequency of 250 Hz. We attached 35 markers to the subject and 4 markers to the chair. Using inverse dynamics, we analyzed torque exerted by the lower extremity joints. **Results:** Comparing the sit-to-stand movement pattern from the fixed chair with the sit-to-stand movement pattern from the rocking chair, the following results were shown. Torso angle was significantly higher at the moment of separation from the seat in the females using the rocking chair. There was no significant difference in the peak of seated ground reaction force or in the valley of foot reaction force. Horizontal velocity during standing up from each chair showed no significant difference between the two tasks. **Conclusion:** These results suggest that a rocking chair is beneficial for diminishing the lower extremity load.