

Effect of Wheelchair Transfer Surface Firmness on Acceleration of the Torso

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ABSTRACT

Moving from a surface that provides adequate support can affect the quality of wheelchair transfers such that softer surfaces, which are less supportive may compromise these movements. **PURPOSE:** This research examined the effect of surface firmness on wheelchair transfer performance. **METHODS:** A convenience sample of fourteen healthy, able-bodied college students, who's average height, weight and age were 76kg, 167 cm, and 20.5 years, respectively, participated in this study. Participants were taught a basic wheelchair transfer. A wireless triaxial accelerometer was positioned on the dorsal surface of the trunk at approximately the mid-thoracic level. Participants performed five trials under two surface conditions, hard and soft. All trials were videotaped and evaluated by a licensed OT using the Transfer assessment Instrument (TAI). Kinematic measures included transfer time, maximum, minimum, and change in acceleration in three orthogonal dimensions. Each trial was scored by the OT using the TAI. Kinematic measures and TAI scores were compared between surface conditions using paired t-tests and Cohen's d. Qualitative clinical measures from the TAI were correlated to the acceleration measures using Pearson Correlation tests. **RESULTS:** Maximum acceleration in the vertical direction during a transfer from a hard surface was significantly higher than from a soft surface ($t = 2.29, p = 0.04$). Lean during the movement was indicated by significantly higher minimum acceleration in the medial-lateral (ML) direction when transferring from a hard surface ($t = -4.86, p = 0.0$). However, there was no significant difference in minimum acceleration in the anterior-posterior (AP) direction between the two conditions. The two-tailed t-test suggested that there was no significant difference between the TAI scores of either condition ($t = -0.58, p = 0.58$). The minimum acceleration for transfers from a hard surface had a strong negative correlation to TAI scores ($r(6) = -0.72, p < 0.05$). **CONCLUSION:** Minimum acceleration in ML directions moving from a hard surface indicate more leaning, which may be due to the stability of the hard surface. Strong negative correlation between min acceleration and TAI means that the more someone leans in the ML direction during a transfer, they worse their quality score is.