Kinetic and Kinematic Features of Failed Sit-to-stand Trials in Stroke Patients: Analysis Using a Dynamic Balance Index

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Purpose: The purpose of this study was to investigate the features of failed sit-to-stand by analyzing the differences between accomplished and failed task in stroke patients.

Methods: From 136 stroke patients in whom sit-to-stand was measured using a three-dimensional motion analysis system and force plates, 7 who failed in one sit-to-stand trial but succeeded in another trial were extracted for comparative analysis. Differences in the following kinetic and kinematic data were compared between the failed and accomplished trials by the nonparametric Wilcoxon signed-rank test: displacement of the center of mass (COM), center of pressure, extrapolated center of mass (Xcom), and peak joint moments.

Results: In the accomplished trials, Xcom moved significantly further forward over the ankle compared with the failed trials at lift off. The peak hip extension moments was increased in accomplished trials while transitioning from sitting to standing.

Conclusions: Because Xcom could not move forward sufficiently, COM was forced backward to compensate in failed sit-to-stand. Thus, to accomplish sit-to-stand, it is important for stroke patients to relearn the hip flex direction that increases COM forward velocity and to activate the hip extension muscles.