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Conceptualization and design of a surface translation balance training device

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Abstract

Research supports the idea that dynamic control of both a person’s center of mass and base of support are necessary to prevent falls, and that older adults can learn this combined control through specific balance training. Effective balance training requires a large number of repetitions of task-specific practice. Externally induced movements have been employed in balance studies both to test and train balance responses, most often using mechanized surface perturbations. These systems however are quite expensive; therefore, we chose to investigate a more cost effective solution focusing on surface translation for balance training in our lab.

We performed a literature review of balance testing or training studies which had successfully used a translating surface paradigm. The motion parameters and subject characteristics were compiled (Table 1) to arrive at a decision about the parameters to be designed into our device. The device was designed to meet the space and subject use needs, compiled motion parameters, and engineering and safety requirements. A scotch yoke mechanism was chosen as well as a DC Motor and an appropriate gearbox, which were designed to translate, via a steel arm, a plywood and square tubing platform.