Effect of Aging on Human Postural Control: A Predictive Modeling Approach

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Falls are a serious medical and public health problem facing adults aged 65 and older. Falling to the side is has been identified as an important causal factor for hip fracture, which is associated with up to 20% chance of death. Aging appears to present particular problems for lateral balance related to falls. A better understanding of the mechanisms underlying falls would be significant in designing risk assessment or interventions towards fall prevention. Further, this could lead to a diagnostic and prognostic tool for balance disorders. The aim of this research is to develop a model for the effect of aging on postural control based on clinical data (available in literature and at UC Center for Neuroscience). This model will provide a basis for future development of a diagnostic and prognostic tool for balance disorders triggered due to aging such as Parkinson's disease. Human balance is critical to many aspects of our daily lives. Even the act of standing quietly requires a complex integration of multiple sensory inputs, decision processes, and motor planning. For many of us, these complicated control processes generally work well and are consequently taken for granted. However, balance disorders can be a serious and significant health problem that cuts across ethnic and socioeconomic groups. The *goal* of this project is to conduct a detailed numerical study of the nonlinear dynamics and stability of human posture using nonlinear system analysis tools (e.g. bifurcation theory) using low-order models. Further, using existing literature and published data a normal form model of the effect of aging and balance disorders will be integrated into the low-order models. Ultimately, this project will result in an enhanced understanding for advanced diagnostic and prognostic approaches related to human balance disorders. The long-term goal of this research is to develop novel ideas for the cooperative use of nonlinear dynamical systems theory in neurosciences and medicine with specific focus on balance disorders.

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