Modeling Standing Postural Control in Parkinson's Disease Patients

Parkinson's disease (PD) is one of the neurodegenerative diseases known to cause postural control deficits and a distinctive standing posture, referred to as abnormal posture. Increased muscle tone is thought to play a role in this abnormal posture, but accurate measurement of muscle tone during standing is not easy, and the relationship between muscle tone and abnormal posture is not fully understood. Abnormal posture can lead to dysphagia and back pain, which significantly affect patients' quality of life (QOL). Therefore, it is important to elucidate the mechanisms behind these abnormal postures and postural control disorders and to establish effective treatment methods.

We aim to elucidate the mechanisms behind abnormal postures and postural control disorders in PD patients by performing forward dynamics simulations of postural control using computational models. In our previous research, we developed a neural controller model capable of controlling a musculoskeletal model with numerous muscles and degrees of freedom in the joints. This neural controller model takes into account the function of descending pathways that are important for maintaining standing posture. By adjusting control parameters based on data obtained from Parkinson's patients, we have investigated the relationship between muscle tone and abnormal posture. We are also using these models to investigate how dopamine, a neurotransmitter in the brain, is involved in the control of standing posture.

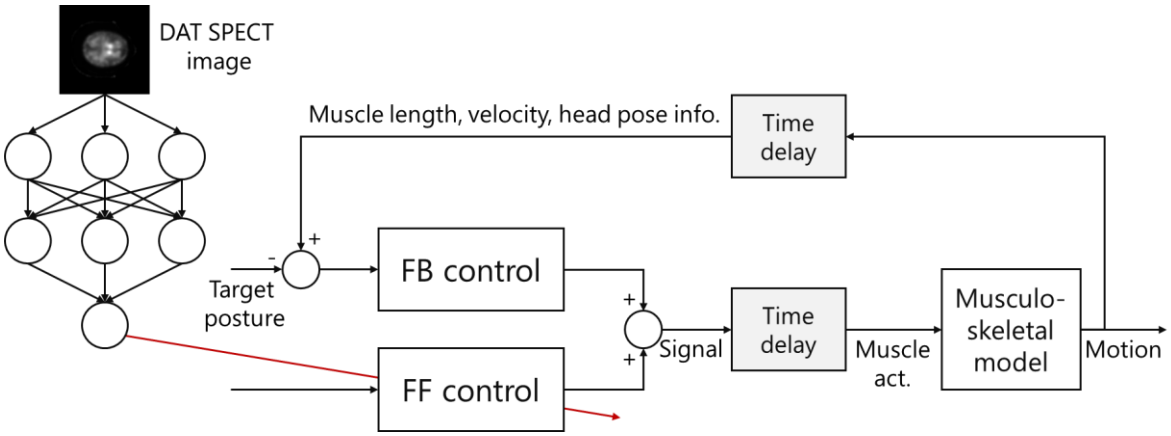

Fig 1. A neural controller model of standing postural control considering dopamine function.

Keywords: Parkinson's disease, Abnormal Posture, Muscle Tone

References

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