

# Sway Analysis of Stroke Patients in Standing Posture

Stroke is a disease in which the brain's function is impaired due to a rupture or blockage of blood vessels in the brain, preventing blood from reaching the brain properly. It is known that the standing posture of stroke patients is more unstable than that of normal subjects, and the risk of falling is higher. Although the influence on standing postural control differs depending on the mechanism and site of stroke onset, and the appropriate rehabilitation and training methods may differ accordingly, detailed analysis has not been fully performed. We first focused on patients with cerebral infarction and cerebral hemorrhage, the two most common types of stroke, and investigated the differences in postural sway between them.

We used the dynamic time-warping method to cluster time-series data on the swaying of stroke patients in the standing posture [1]. As a result, the data were divided into different clusters mainly according to the number of days since onset. Among them, cerebral hemorrhage patients showed a clear transition between the number of days since onset and the cluster, whereas the relationship was not clear for stroke patients, indicating that there may be a difference in recovery with the passage of days between the two groups. The possibility of different postures during standing between cerebral infarction and cerebral hemorrhage patients has also been investigated [2]. In the future, we will analyze the findings of these studies in conjunction with the computational models we have constructed to clarify the differences in postural control mechanisms.

**Keywords:** Postural control, Stroke, Time-series clustering

## References

- [1] D. Li, K. Kaminishi, R. Chiba, K. Takakusaki, M. Mukaino and J. Ota, "Evaluation of Postural Sway in Post-stroke Patients by Dynamic Time Warping Clustering," *Frontiers in Human Neuroscience*, vol. 15, 2022, doi: 10.3389/fnhum.2021.731677.
- [2] D. Li, K. Kaminishi, R. Chiba, K. Takakusaki, M. Mukaino and J. Ota, "Evaluating quiet standing posture of post-stroke patients by classifying cerebral infarction and cerebral hemorrhage patients," *Advanced Robotics*, vol. 35, no. 13-14, pp. 878-888, 2022, doi: 10.1080/01691864.2021.1893218.

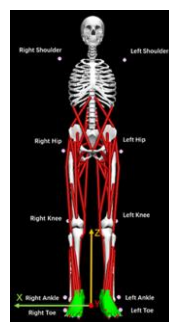


Figure 1. Marker positions used in the analysis. A total of 10 marker positions were recorded for the left and right sides.

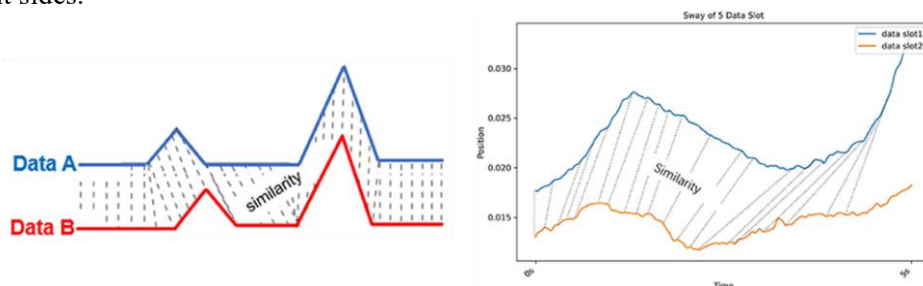


Figure 2. Conceptual diagram of the dynamic time-warping method and examples of similarities calculated with actual sway data.