Objective: Our previous studies suggested that hot spring aquatic exercise may immediately improve the balance ability. As the long-term effects of such repeated exercise have not yet been examined, this present study aims to analyze them, focusing on the balance-related physical indexes.

Methods: A total of 12 patients (the number of cerebrovascular disease patients: 5; the number of orthopedic disease patients: 7; mean age: 71.9 ± 13.1; FIM: 117 ± 7.5; and FBS score: 46.4 ± 6.7), who had been treated with hot spring aquatic exercise therapy in our hospital were studied. Each patient showed decreased balance ability due to paralysis, sensory disturbance, or fracture. The measurement indexes were the ability to bend forward while sitting with their legs straight, Functional Balance Scale (FBS), Functional Reach Test (FRT) and Timed Up and Go (TUG) scores, sensory function was measured by the instrument (Semmes-Weinstein Monofilaments), and skin stiffness. Those were measured immediately, 10, 20, and 30 days after the initiation of the intervention. Furthermore, indexes of eight patients out of those were measured 60 days after the initiation. Each exercise session consisted of walking forward and backward, hip abduction, flexion, and extension, lunge, and squat, which lasted approximately 15 minutes. The loading level was set at a pulse of 77 ± 11.2 ≥ 84 ± 13.5/minute, with a perceived exertion rate (modified Borg Scale) of 0.7 ± 1.0 ≥ 2.4 ± 2.3.

Results: The ability to bend forward while sitting with their legs straight, TUG, FBS and sensory function, scores have improved significantly. Any significant improvements were not observed on FRT and skin stiffness.

Discussion: The improvement of the sensory function was observed in patients with cerebrovascular disease. This would be because these therapies have the effect on the improvement of higher neuronal function. It is assumed that training efficiency in itself was improved, as the buoyancy and hydrostatic pressure assisted the patients to keep balance.

This exercise showed more effectiveness on the complicated balance indexes. On evaluation of each balance index, the TUG scores significantly improved significantly, while the FRT scores did not show any effects. As the balance-related indexes started to show improvements
30 days after the initiation, it should be recommended to continue this exercise for 30 days or more. Furthermore, in those who had not reached the maximum FBS score 30 days after the initiation, the improvement in scores was observed after 60 days. Further studies will be necessary to analyze these physical indexes, which showed improvements so that more effective exercises for each patient can be programmed taking the relevant balance-related physical indexes into account.

**Keywords:** Rehabilitation therapy, Aquatic exercise, Balance ability, Cerebrovascular disease, Orthopedic disease