

# **An Exergame-Integrated IoT-Based Ergometer System for Personalized Training of the Elderly**

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Reduced physical activity is reported in the elderly, especially in institutional residents. Institutionalized older adults exhibit a high prevalence of frailty. We developed an artificial intelligence of things (AIoT)-based feedback assistive strengthening ergometer (AIFASE), for the physical strengthening of the elderly with intelligent assistance. The AIFASE system allows the clinical staff to record the personal physical performance of the elderly and generates personalized exercise prescriptions accordingly. AIFASE also displays the current usage status of all ergometers and the users' physiological conditions. The algorithms were developed to generate warning alerts when the training workload was too large by personal physiological detection. AIFASE automatically customized the exercise prescription according to the user's exercise performance.

A 12-week intervention in a long-term care facility was conducted. In total, sixteen participants ( $84.38 \pm 6.0$  years; 4 males and 12 females) were recruited with 1:1 randomization of exercise to control groups. The muscle strength of the lower extremities, timed up and go test (TUG), and Short-form Physical Performance Battery (SPPB) of the participants were measured. After a 12-week AIFASE intervention, the intervention group exhibited significant improvements in the strength of the hip flexor, Semi-Tandem Stand, and Tandem Stand. In conclusion, we developed an AIoT ergometer that delivered customized physical training prescriptions to improve the physical performance of long-term care facility residents. We believe that the application of AIFASE could help improve the quality of institutional care.

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