Immediate effect evaluation of a robotic ankle–foot orthosis with customized algorithm for a foot drop patient: a quantitative and qualitative case report

ABSTRACT

This study aims to evaluate the immediate effect of a robotic ankle–foot orthosis developed in previous studies on a foot drop patient. The difference with previous research on AFO evaluation is that this research used a setting based on the patient's request. The robotic AFO locked the foot position on zero radians during the foot flat until the push-off but generates dorsiflexion with a constant velocity in the swing phase to clear the foot drop. A kinematic and spatiotemporal parameter was observed using the sensors available on the robotic AFO. The robotic successfully assisted the foot drop (positive ankle position of 21.77 degrees during the swing phase and initial contact) with good repeatability ($\sigma^2 = 0.001$). An interview has also conducted to investigate the qualitative response of the patient. The interview result reveals not only the usefulness of the robotic AFO in assisting the foot drop but also some improvement notes for future studies. For instance, the necessary improvement of weight and balance and employing ankle velocity references for controlling the walking gait throughout the whole gait cycle.