Online Journal Club – Article Review

Background/Overview	
Article Citation	Yang A, Asselin P, Knezevic S, Kornfeld S, Spungen A. Assessment of In-Hospital Walking Velocity and Level of Assistance in a Powered Exoskeleton in Persons with Spinal Cord Injury. *Topics in Spinal Cord Injury Rehabilitation.* 2015;100-109.
Study Objective/Purpose (hypothesis)	The primary purpose of the study was to evaluate the velocities of exoskeletal assisted walking, numbers of therapy sessions and the levels of assistance needed to operate an exoskeletal-assisted device. The secondary purposes of the study were to assess gait and posture during exoskeletal assisted walking and the safety of the exoskeleton.
Brief Background (why issue is important; summary of previous literature)	To be safe and active in the community a walking speed of 0.40 m/s when using an exoskeletal assisted device is ideal. An exoskeleton can assist with upright posturing and weight-bearing through the lower extremities which are important in the prevention of osteoporosis, heart disease, and obesity and assisting bowel/bladder function.
Methods	
Study Design (type of trial, randomization, blinding, controls, study groups, length of study, follow-up)	• Single group observational study • No follow-up
Target Population (dx, acuity, inclusion/exclusion criteria)	Participants age 18-65 with a chronic (> 6 months duration) diagnosis of motor complete/incomplete spinal cord injury (SCI) of the low cervical level. Exclusion criteria: • Neurological diagnosis other than SCI (MS, CVA, CP, ALS, TBI, Spina Bifida, Parkinson's) • Severe disease/illness • Recent lower extremity fracture (<2 years) • DXA indicating t-score below -3.0 at lumbar spine and BIL proximal femurs • Knee BMD <0.70g/cm^2

	• Infection • Cardiovascular disease • Pressure ulcers (trunk and/or lower extremity) • Exclusionary diagnosis/conditions deemed by the physician • Severe spasticity (>4.0 Ashworth scale) • Significant contractures 35° of hip or 20° knee • Heterotopic ossification of lower extremities
Interventions (if applicable): (specificity of intervention, ability to replicate, frequency, duration)	Before gait training could begin, participants were required to complete a one-hour training and safety seminar over the exoskeleton and how to initiate movement in the device. The participants had to be able to initiate steps and take continuous steps without verbal cues before the 6 and 10-minute walk tests were performed. During every session of gait training in the exoskeleton participants completed the 6-minute walk test and tried to improve their time from the previous session. The walk tests were performed in a hallway.
Outcome Measures (relevant to purpose of the study; reliable, valid, clinical utility)	6 minute walk test (6MWT), 10 minute walk test (10MWT), Level of Assistance (LOA)
Statistical Analysis (statistics used, appropriate application)	Individual values for the demographic characteristics, 6MWT, 10MWT, LOA and lower limb and tilt parameter settings were reported. The study used descriptive statistics for the mean plus or minus standard deviation for duration of injury and age. Box plots were created for the EAW 10MWT velocity split by LOA groups. 10MWT velocity was compared across LOA groups by nonparametric analysis using Spearman rank correlation coefficient.
Results	
Enrollment/Subject Characteristics (sample size, gender, age, functional level; were groups similar on important variables prior to application of the intervention)	• Sample size: 12 • 2 women, 10 men • Age: 24-64 years • Mean injury duration 6.8 years • All participants received the same intervention.

Summary of Primary and Secondary Outcomes (include aggregate and sub-group findings if reported); note results that were statistically significant (exceed MCID if known); Was there retention of changes following intervention (if studied)	Out of the 12 participants 7 were able to achieve the optimal gait speed of >0.40 m/s. Retention of changes was not studied.
Author's Discussion and Conclusion	
Brief Summary of Author's Main Discussion Points; Author's Conclusion	7 of the 12 participants were able to achieve a gait velocity of at least 0.40m/s, which is readily accepted as an appropriate speed to be a community ambulator. The participants that were able to achieve this faster gait velocity also require less assistance than those who had a slower gait velocity. Proper posture and ability to weight shift while in the exoskeleton also correlated to a faster gait velocity. Further research needs to be conducted to assess the ability to avoid obstacles such as stairs and curbs that community ambulators experience.
Reviewer's Discussion and Conclusion	
Study Strengths	
Study Limitations and Potential for Bias	Limitations of this study were the availability of the exoskeleton, small sample size and varied total training sessions. Exoskeletons are expensive and not readily available in hospital, rehab or outpatient settings.
Applicability: • **Types of patients (dx) that results apply to** • **Types of settings or patient acuity that the results apply to** • **Can interventions be reproduced? Can results be**	The results of this study are applicable to individuals with spinal cord injuries that have the ability to use forearm crutches. The results are applicable to most therapy settings and that have available exoskeleton systems. This study supports the findings of others that the exoskeleton used in this study was safe for ambulation. Further research is needed to determine if those that have other neurological disorders may benefit from the results of this study.

applied to other pt populations?	
How will study results impact PT management of this patient population?; List suggestions how to implement changes in your clinic/department to integrate study findings into patient care	The study results may have an impact on this patient population who have access to exoskeletons in clinics.