



# STROKE SPECIAL INTEREST GROUP

Academy of Neurologic Physical Therapy

## In this newsletter...

- \*\*NEW Article Review!!
- Thank you to those who attended the ANPT Conference!
- Registration and Housing Open for CSM 2024!



## STROKE SIG ARTICLE REVIEW

Academy of Neurologic Physical Therapy



You can either read below, or listen to the audio version with  
this [LINK](#)

**Completed by:** Eyad Kawwa, PT, DPT, NCS  
Thank you, Eyad!

**Overseen by:** Daniel Dray, PT, DPT, NCS

**Summary Topic Title:** The Interplay Between Walking Speed, Economy, and Stability After Stroke

**Article Reference:** Awad LN, Knarr BA, Kudzia P, Buchanan TS. The Interplay Between Walking Speed, Economy, and Stability After Stroke. *J Neurol Phys Ther.* 2023;47(2):75-83. doi:10.1097/NPT.0000000000000431

**Link to abstract:**

[https://journals.lww.com/jnpt/abstract/2023/04000/the\\_interplay\\_between\\_walking\\_speed\\_economy\\_and.3.aspx](https://journals.lww.com/jnpt/abstract/2023/04000/the_interplay_between_walking_speed_economy_and.3.aspx)

**Definitions:**

-*Economy*: the energy needed to move 1 kg of bodyweight 1 ml O<sub>2</sub>/kg/m. Faster speeds typically result in better walking economy post-stroke.

-*Stability*: the regularity and divergence of the mediolateral motion of the pelvic center of mass (pCOM) and the pCOM motion relative to the base of support. Faster speeds typically result in worsened stability post-stroke.

-*Slow speed*: 20% slower than the preferred walking speed during the 10 m walk test  
-*Preferred speed*: comfortable speed measured during the 10 m walk test  
-*Fast-1 speed*: long-distance speed measured as the average 6-minute walk test speed  
-*Fast-2 speed*: maximum walking speed measured during the 10-m walk test  
-*Chronic poststroke hemiparesis*: unilateral weakness in patients more than 6 months after stroke

**Purpose of article:** The purpose of this article was to examine the interplay between walking speed, economy, and stability in patients with chronic post stroke hemiparesis.

**Methods of interest:** Seven individuals with chronic post-stroke hemiparesis participated in this investigation. Their first visit included administration of outcome measures (10-m walk test, 6-minute walk test, the Functional Gait Assessment, and the lower extremity motor portion of the Fugl-Meyer). The second visit included 4 trials of treadmill walking. Each trial was targeted at 4 minutes in length and tested at one of the following speeds: Slow, Preferred, Fast-1, and Fast-2. The final 2 minutes of steady-state walking from the slow-speed, preferred-speed, and fast-speed trials provided the data from which the walking economy and stability outcomes of interest were computed as follows:

-*Walking economy*: mass-normalized oxygen consumption per meter ( $O_2/kg/m$ )  
-*Dynamic walking stability* was measured using a (i) sample entropy analysis, (ii) maximum Lyapunov exponent (LyE) analysis, and (iii) margin of stability analysis. An improvement in dynamic stability was defined as an improvement in at least one measure below without a worsening in the others.

(i) *Sample entropy* quantifies walking regularity. Lower entropy values mean a more predictable and stable system. Higher entropy value means a less predictable and more chaotic system.

(ii) *LyE* quantifies patterns of divergence in pCOM motion across strides. Lower LyE indicates less signal divergence and a more stable system.

(iii) *Margin of stability* was based on pCOM motion relative to the base of support. A larger margin of stability was thought to indicate greater resistance to perturbation.

### **Results of interest:**

Energy expenditure at preferred walking speed was a median  $14.12 \pm 2.16$  ml  $O_2/kg/min$ . When reduced to slow speeds, energy expenditure reduced by 7.85%. When increased to fast speeds, energy expenditure was increased by 23.11%.

Economy at preferred speed was a median  $0.29 \pm 0.07$  ml  $O_2/kg/m$ . Economy worsened by 11.9% at slow speeds and improved by 8.6% at fast speeds.

Walking became 16.96% more irregular at fast speeds, and 10.27% more regular at slow speeds. LyE was reduced by 26.11% at slow speeds indicating better stability. LyE was not observed to significantly change at fast speeds. Differences in margins of stability were not observed across the different walking speeds.

**Discussion:** People with chronic poststroke hemiparesis may walk slower than their most economical speed to avoid a decrease in stability, however, they may also walk faster than their most stable speed to avoid a metabolic penalty. These patients may be capable of walking at faster, more economical speeds; however, they may elect not to due to decreased stability. Conversely, they may avoid even slower speeds due to worsening walking economy. To facilitate faster and more economical walking, deficits in control of the mediolateral motion of the body during walking should be

considered.

**Additional resources:**

Supplemental Digital Content, Video Abstract: <http://links.lww.com/JNPT/A416>

Locomotor CPG: Chronic CVA, SCI, TBI Clinician

Resources: [https://neuropt.org/practice-resources/anpt-clinical-practice-guidelines/locomotor/clinician\\_resources](https://neuropt.org/practice-resources/anpt-clinical-practice-guidelines/locomotor/clinician_resources)

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A big...



**...to those who attended the 3rd Annual ANPT Conference!!**

Enjoy continued access to On-Demand content from Mid-October – November 30, 2023!

Click [HERE](#) for more details!

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**CSM registration and housing for 2024 is now OPEN!**

Follow this [link](#) for more details! We hope to see you in Boston in February!



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