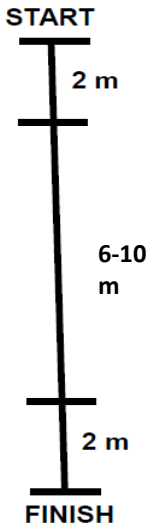
Dare to be first.

UNIVERSITY OF DELAWARE

10 Meter Walk Test for Adults with Lower-Limb Amputations



Description: The 10 Meter Walk Test (10MWT) is a performance-based measure that may be used to assess gait speed in patients with one or more lower-limb amputations who may or may not be using a prosthesis.[1]

Equipment[2]: A clear pathway at least 10 meters long with lines on the floor indicating the start, finish, and 2-meter marks from either end; a stopwatch; assistive device (if needed)

Patient Instructions:
Self-Selected Speed: "When I say go, walk at your normal comfortable pace to the finish line."
Fast Speed: "When I say go, walk as fast and as safely as possible to the finish line."

Clinician Instructions: Start timing when the patient's first crosses the 2-meter mark and stop timing when the patient's completely passes the 8-meter mark, which allows for 2 meters of acceleration at the start and 2 meters of deceleration at the end of the course. Record for 3 trials and then take the average for each walking condition, i.e., self-selected and fast speeds. Calculation for each walking condition: 6m/time (s) =__ m/s

Test-Retest Reliability[19]: ICC (95%CI): .96 (.93-.98)
(for timed 10 m of 14 m course)
Interrater Reliability[19]: ICC (95%CI): .99 (.98-.99)
Concurrent Validity[16]
MDC_{90}[19]: 0.9 s (0.4-1.4) (for time to complete 10 m of 14 m)
SEM[19]: 0.4 s (for time to complete 10 m of 14 m)
MCID: Unknown in adults with lower-limb loss
Floor/Ceiling Effects: Unknown in adults with lower-limb loss
Predictive Ability[6]: ≤.44 m/s = Prosthetic nonusers with a transtibial amputation (or more proximal amputation) or bilateral amputations 1 year post-discharge from rehabilitation

Factors Negatively Impacting Gait Speed: Non-Modifiable: Advanced Age[11], Shorter Residual Limb[5], Etiology[13-15] [e.g., dysvascular: .75±.15 to .80±.19 to .85±.02 m/s vs. traumatic: .99±.02 m/s]; Modifiable: ↓ Cardiorespiratory Fitness[7,8], ↓ Amputated-Side Hip Extensor Strength[9,10], ↓ Hip Flexion & Extension ROM[11], Prosthetic Componentry, EMG equipment[3,1]

Reference: Prosthesis Users with Unilateral Amputation (m/s)	Mean±SD
Traumatic Transtibial Amputation (n=24; 28±5 y)[2]	
Self-selected speed	1.25±0.12
Transfemoral Amputation* (n=16; 15-63 y)[3]	
Self-selected speed	1.04±0.21
Fast speed	1.26±0.29
Knee Disarticulation* (n=5; 20-70 y)[3]	
Self-selected speed	1.19±0.25
Fast speed	1.46±0.35
*Amputation etiology not specified.	

Reference: Longer-Term Unilateral Prosthesis Users (m/s)[17]	
K-level	**Mean±SD (95% CI)**
K3 (n=35; age: 60±12 y)	
Self-selected speed	0.88±0.04 (0.80-0.96)
Fast speed	1.12±0.05 (1.02-1.22)
K4 (n=20; age: 46±12 y)	
Self-selected speed	1.21±.05 (1.11-1.32)
Fast speed	1.56±.07 (1.41-1.70)
Note: Using center 6 m timed from 10 m course.	

Mean±SD for Able-Bodied Adults (m/s)[4]			
Age (y)	Sex	Self-selected speed	Fast speed
20-29 (n=37)	Male	1.39±0.15	2.53±0.29
	Female	1.41±0.18	2.47±0.25
30-39 (n=36)	Male	1.46±0.09	2.46±0.32
	Female	1.42±0.13	2.34±0.34
40-49 (n=43)	Male	1.46±0.16	2.46±0.36
	Female	1.39±0.16	2.12±0.28
50-59 (n=43)	Male	1.39±0.23	2.07±0.45
	Female	1.40±0.15	2.01±0.26
60-69 (n=36)	Male	1.36±0.21	1.93±0.36
	Female	1.30±0.21	1.77±0.25
70-79 (n=42)	Male	1.33±0.20	2.08±0.36
	Female	1.27±0.21	1.74±0.28

Reference Values: IPOP Users at Rehabilitation Discharge (m/s)	
Unilateral LLL (n=110; age 63±13 y)[18]	**Median (IRQ)**
K1 (n=6)	0.17 (0.15-0.19)
K2 (n=43)	0.38 (0.25-0.54)
K3 (n=54)	0.63 (0.50-0.71)
K4 (n=7)	1.06 (0.95-1.18)
Note: Self-selected speed using 10 m timed.	

[1]Wong, C.K., et al. Exercise Programs to Improve Gait Performance in People with Lower Limb Amputation: A Systematic Review. *Prosthet Orthot Int*. 2016;40:8-17. [2]Russell Esposito, E., et al. Gait Biomechanics Following Lower Extremity Trauma: Amputation vs. Reconstruction. *Gait Posture*. 2017;54:167-173. [3]Boonstra, A. M., et al. Walking Speed of Normal Subjects and Amputees: Aspects of Validity of Gait Analysis. *Prosthet Orthot Int*. 1993:17:78-82.[4]Bohannon, R.W. Comfortable and Maximum Walking Speed of Adults Aged 20-79 Years: Reference Values and Determinants. *Age Ageing*. 1997:26:15-9.[5]Bell, J.C., et al. Transfemoral Amputations: The Effect of Residual Limb Length and Orientation on Gait Analysis Outcome Measures. *J Bone Joint Surg Am*. 2013;95:408-414.[6]Roffman, C.E., et al. Locomotor Performance During Rehabilitation of People with Lower Limb Amputation and Prosthetic Nonuse 12 months After Discharge. *Phys Ther*. 2016;96:985-994.[7]Gjovaag, T., et al. Assessment of Aerobic Capacity and Walking Economy of Unilateral Transfemoral Amputees. *Prosthet Orthot Int*. 2014;38:140-147. [8]Wezenberg, D., et al. Relation between Aerobic Capacity and Walking Ability in Older Adults with a Lower-Limb Amputation. *Arch Phys Med Rehabil*. 2013;94:1714-1720. [9]Renstrom, R., et al. Thigh Muscle Strength in Below-Knee Amputees. *Scand J Rehabil Med Suppl*. 1983:9:162-173. [10]Powers, C.M., et al. The Influence of Lower-Extremity Muscle Force on Gait Characteristics in Individuals with Below-Knee Amputations Secondary to Vascular Disease. *Phys Ther*. 1996;76:369-377. [11]Boonstra, A.M., Schrama, J., et al. The Gait of Unilateral Transfemoral Amputees. *Scand J Rehabil Med*. 1994;26:217-223. [12]Gates, D.H., et al. Kinematic Comparisons of Walking on Uneven Ground Using Powered and Unpowered Prostheses. *Clin Biomech (Bristol, Avon)*. 2013; 28:467-472. [13]Hubbard W.A., McElroy, G.K. Benchmark Data for Elderly, Vascular Trans-tibial Amputees after Rehabilitation. *Prosthet Orthot Int*. 1994;18:142-149. [14]Skinner, H.B., Effeney, D.J. Gait Analysis in Amputees. *Am J Phys Med*. 1985;64:82-89. [15] Hermodsson, Y., et al. Gait in Male Trans-tibial Amputees: A Comparative Study with Healthy Subjects in Relation to Walking Speed. *Prosthet Orthot Int*. 1994;18:68-77. [16]Deathe A.B., Miller, W.C. The L Test of Functional Mobility: Measurement Properties of the Modified Version of the Timed "Up and Go" Test Designed for People with Lower-Limb Amputations. *Phys Ther*. 2005;85:626-635.[17]Sions, J.M., et al. Differences in Physical Performance Measures Among Patients with Unilateral Lower-Limb Amputations Classified as Functional Level K3 versus K4. *Arch Phys Med Rehabil*. 2018;99:1333-1341. [18]Batten, H.R., et al. Gait Speed as an Indicator of Prosthetic Walking Potential Following Lower Limb Amputation. *Prosthetics Orthot Int*. 2019;43:196–203. [19]Sawers, A., et al. Interrater and Test-retest Reliability of Performance-based Clinical Tests Administered to Established Users of Lower Limb Prostheses. *Phys Ther*. 2020;100:1206-1216.