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Optimal Distance for Normal Gait Speed Testing

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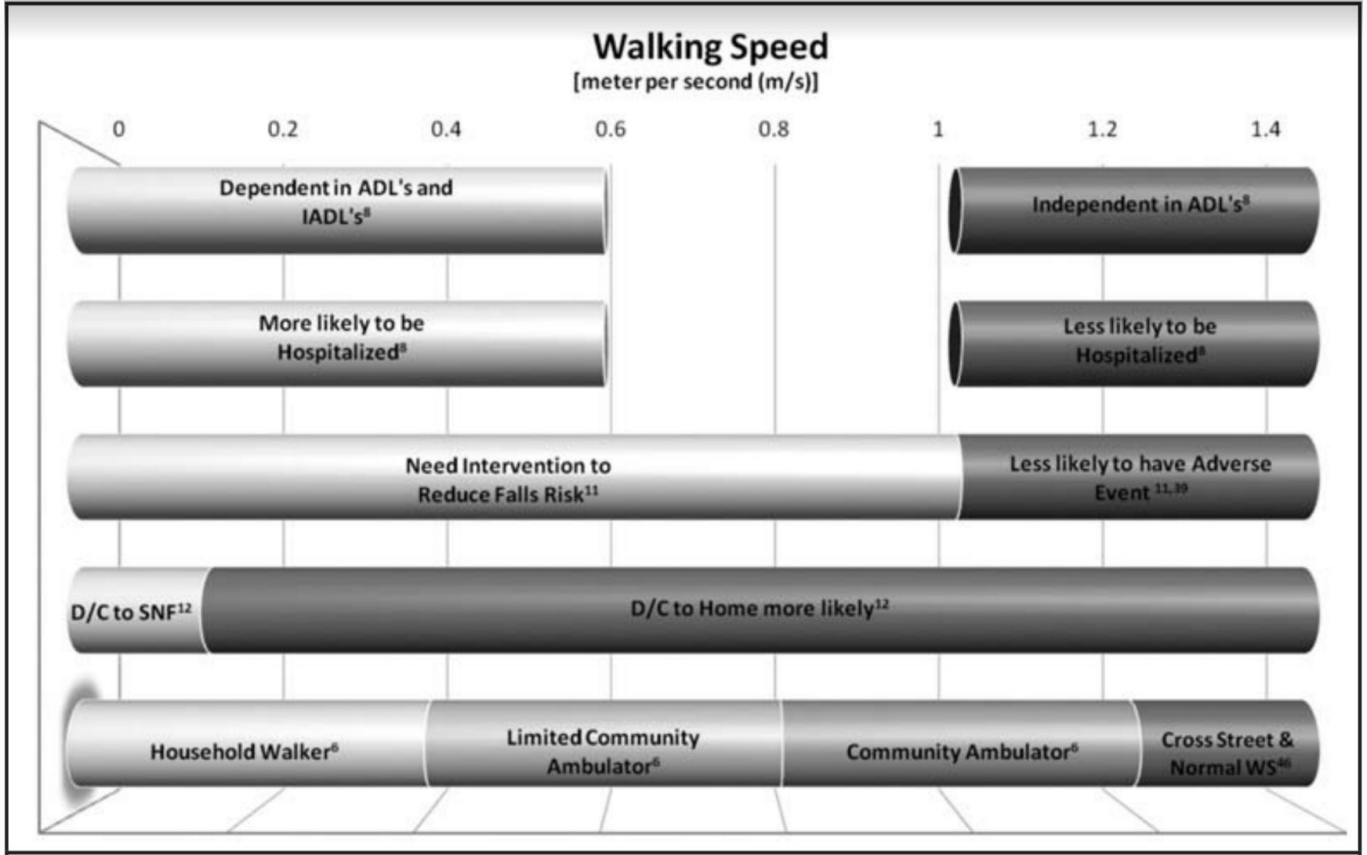
Introduction

Walking tests are simple, easy tests to examine: [5-9]

- Functional independence
- Future health deterioration
- Screen for chronic lifestyle diseases such as hypertension
- Aid in clinical decision making such as:
  - Whether the patient will be homebound
  - Likelihood of hospitalization
  - Location of release after hospital visits



0 mph	0.4 mph	0.9 mph	1.3 mph	1.8 mph	2.2 mph	2.7 mph	3.1 mph
10 meter walk time	50 sec	25 sec	16.7 sec	12.5 sec	10 sec	8.3 sec	7.1 sec
10 foot walk time	15.2 sec	7.6 sec	5 sec	3.8 sec	3 sec	2.5 sec	2.2 sec

ADL: activities of daily living; IADL: instrumental ADLs; D/C: discharged; WS: walking speed; mph: miles per hour; sec: seconds

Literature Review

- After a lit review, Middleton et al. (2015) recommended:
  - 20m walk test; only measure middle 10m
  - Start and end = accelerate and decelerate
  - Potent walking speed test as long as there is room for acceleration and deceleration.

- Alves and colleagues (2017):
  - Distances others used:
    - 2.44-4.6m (8 studies)
    - 6-6.15m (5 studies)
    - 20m (1 study)

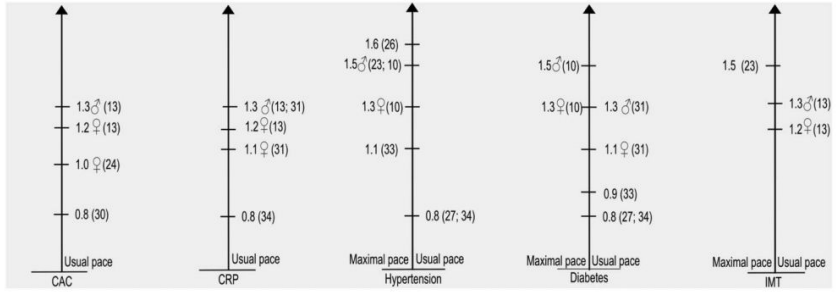


Figure 2. Association between walking speed thresholds ($m \cdot s^{-1}$) and cardiovascular risk factors. CAC = coronary artery calcification; CRP = C-reactive protein; IMT = intima-media thickness.

Different protocols generate a gap in knowledge of and a questioning in the test's accuracy.

Our previous research

- Tested a smartphone:
  - 6th Vital Sign App
    - Reliable
    - Not Valid
- Brower Timing Gates
    - Reliable
    - Valid

Current research question:

What is the most effective distance for a gait speed test?

Purpose

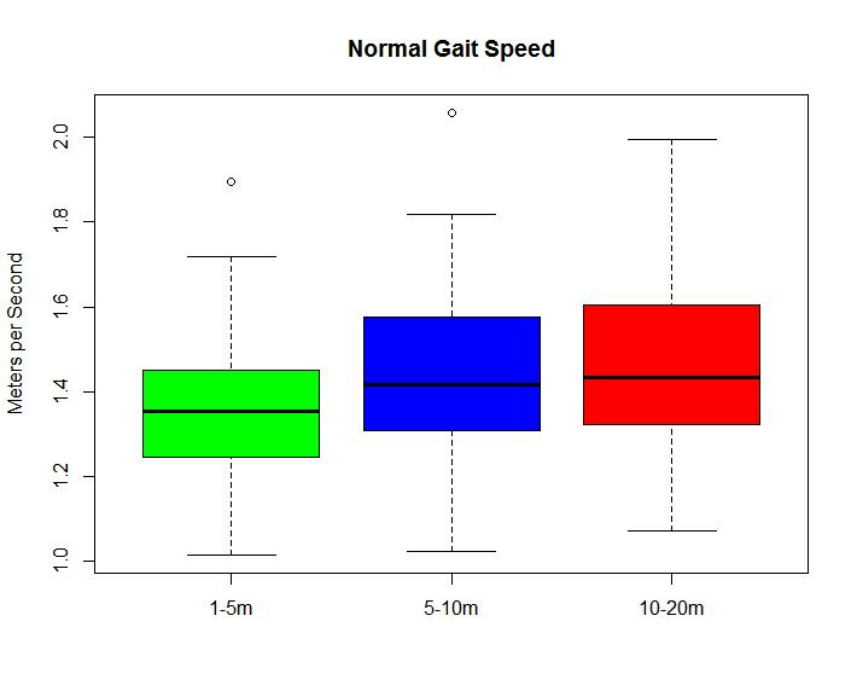
To determine the optimal distance segment for calculating gait speed, which can be used to standardize walking tests in clinical settings.

Methods

- Sets of Brower Timing Gates (Brower Timing Systems, Draper, USA) were placed at the starting line and at the 5, 10, and 20m marks.
- Subjects:
    1. Started with their toes on the -30 cm line.[9]
    2. Began the test at their volition.
    3. Walked at their normal pace.
- Compared 0-5m, 5-10m, and 10-20m using a linear mixed-effect model.
- Statistics done using R version 3.5.0 with lme4 and lmerTest packages.

Results

36 students completed the assessment (24 female, 11 male, 1 declined to answer; mean age = 21.5 ± 2.6 years, height = 168.8 ± 10.4 cm, mass = 77.2 ± 19.3 kg).



Average gait speed for each test segment:

0-5m	5-10m	10-20m
1.361 m/s	1.449 m/s	1.467 m/s

P-values for comparisons of gait speeds between the different segments:

	5-10m	10-20m
0-5m	$P < 0.0001$	$P < 0.0001$
5-10m	--	0.18

Discussion

- Meaning of Results:
    a. Acceleration (0-5m)
    b. Already stabilized at 5-10m
- Application for gait speed testing:
    c. 10-20m not necessary
    d. Need room for acceleration and deceleration.
- Comparing to Literature:
    e. Short tests (especially 4m) while common[5], have no real world meaning. [14, 15]

Conclusion

Testing patients in clinical settings using walk speed tests under 5 meters is not advised because a patient will still be accelerating to their actual walking speed.

The most efficient distance for measuring gait speed would be between 5-10 meters during a 15m walk test.

Future Work

Continue to refine methods.

We will record from 5-10m but have them walk 15m

Comparing normal vs fast speed as predictor.

Observe difference in health disparities between Latino Americans and European Americans in college age students.

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Questions?