Optimal Distance for Normal Gait Speed Testing

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Optimal Distance for Normal Gait Speed Testing

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California State University, Monterey Bay
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
Walking Speed
{meter per second (m/s)}

<table>
<thead>
<tr>
<th>Speed Range</th>
<th>ADL Impairment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 - 0.2</td>
<td>Dependent in ADL’s and IADL’s</td>
</tr>
<tr>
<td>0.2 - 0.4</td>
<td>More likely to be Hospitalized</td>
</tr>
<tr>
<td>0.4 - 0.6</td>
<td>Need Intervention to Reduce Falls Risk</td>
</tr>
<tr>
<td>0.6 - 0.8</td>
<td>D/C to SNF</td>
</tr>
<tr>
<td>0.8 - 1.0</td>
<td>D/C to Home more likely</td>
</tr>
<tr>
<td>1.0 - 1.2</td>
<td>Less likely to have Adverse Event</td>
</tr>
<tr>
<td>1.2 - 1.4</td>
<td>Independent in ADL’s</td>
</tr>
</tbody>
</table>

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
● 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)
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?
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.
  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.
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:

<table>
<thead>
<tr>
<th></th>
<th>0-5m</th>
<th>5-10m</th>
<th>10-20m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed</td>
<td>1.361 m/s</td>
<td>1.449 m/s</td>
<td>1.467 m/s</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
<th>0-5m</th>
<th>5-10m</th>
<th>10-20m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed</td>
<td></td>
<td>P &lt; 0.0001</td>
<td>P &lt; 0.0001</td>
</tr>
<tr>
<td>5-10m</td>
<td>--</td>
<td></td>
<td>0.18</td>
</tr>
</tbody>
</table>
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. \(^{14, 15}\)
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.
Bibliography


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- Colleagues
Questions?