Measures of Mobility and Functional Impairment: Handgrip Strength

Ryan McGrath, PhD

Hello!

Background

• Assistant Professor
  – Department of Health, Nutrition, and Exercise Sciences

• Affiliate Faculty
  – Center for Large Data Research & Data Sharing in Rehabilitation
    • University of Texas Medical Branch

Research Interests

• Epidemiology of aging

• Topics related to physical activity and health across the lifespan

• Methodological improvements
Presentation Objectives

• Examine how muscle strength is assessed in clinical settings
• Evaluate why low handgrip strength is bad for health
• Determine possible limitations for handgrip strength, and how such limitations could be overcome

Handgrip Strength
Handgrip Strength

Handgrip Strength
Handgrip Strength
Handgrip Strength

Categorical Weakness

- Men: <26-kilograms
- Women: <16-kilograms

- Normalized Handgrip Strength: (handgrip strength (kg) / body weight (kg) or body mass index (kg/m²))
Handgrip Strength

• Weakness is part of frailty evaluations (representing different physiological systems; ability to cope with acute or chronic stressors)
  – Unintentional weight loss (10 lbs. in past year)
  – Self-reported exhaustion
  – Weakness (grip strength)
  – Slow walking speed
  – Low physical activity

Handgrip Strength

• Low handgrip strength has been shown to be associated with:
  – Diabetes
  – Heart disease
  – Dementia and Alzheimer’s disease
  – Functional disability
  – Osteoporosis
  – Premature death

Table 3: Can Nonverbal Predictors Be Fitted to Tumoral and Dementia Predictors in A. Male and F. Female Participants.

<table>
<thead>
<tr>
<th>Variable</th>
<th>A. Male Participants</th>
<th>B. Female Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>1.05 (1.01-1.09)</td>
<td>1.03 (0.98-1.09)</td>
</tr>
<tr>
<td>Employment status</td>
<td>1.00 (0.96-1.04)</td>
<td>0.99 (0.94-1.04)</td>
</tr>
<tr>
<td>Marital status</td>
<td>1.00 (0.95-1.05)</td>
<td>1.00 (0.95-1.05)</td>
</tr>
<tr>
<td>Disability status</td>
<td>1.00 (0.96-1.04)</td>
<td>1.00 (0.95-1.05)</td>
</tr>
<tr>
<td>Cognitive function</td>
<td>1.00 (0.96-1.04)</td>
<td>1.00 (0.95-1.05)</td>
</tr>
</tbody>
</table>
Handgrip Strength

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Table 2. Association Between Handgrip Weakness and Time to Incident Chronic Heart Failure

<table>
<thead>
<tr>
<th>Hazard Ratio</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male (Reference: Female)</td>
<td>1.04</td>
</tr>
<tr>
<td>White (Reference: Black)</td>
<td>0.77</td>
</tr>
<tr>
<td>Age</td>
<td>0.01</td>
</tr>
<tr>
<td>Body Mass Index</td>
<td>1.05</td>
</tr>
<tr>
<td>Current Smoker (Reference: Non-Smoker)</td>
<td>1.48</td>
</tr>
<tr>
<td>Previous Smoker (Reference: No Previous Smoker)</td>
<td>1.22</td>
</tr>
<tr>
<td>Previous Heart Conditions (Reference: No Previous Heart Conditions)</td>
<td>7.02</td>
</tr>
<tr>
<td>Diabetes (Reference: No Diabetes)</td>
<td>1.36</td>
</tr>
<tr>
<td>Self-Rated Health (Reference: Excellent)</td>
<td></td>
</tr>
<tr>
<td>Very Good</td>
<td>2.29</td>
</tr>
<tr>
<td>Good</td>
<td>2.88</td>
</tr>
<tr>
<td>Fair</td>
<td>4.48</td>
</tr>
<tr>
<td>Poor</td>
<td>6.81</td>
</tr>
</tbody>
</table>

Table 3. Association Between Decreased Handgrip Strength and Mild Cognitive Impairment

<table>
<thead>
<tr>
<th>Odds Ratio</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handgrip Strength (5-Kilogram Decrease)</td>
<td>1.16</td>
</tr>
</tbody>
</table>

Table 4. Association Between Decreased Handgrip Strength and Cognitive Impairment Progression

<table>
<thead>
<tr>
<th>Odds Ratio</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handgrip Strength (5-Kilogram Decrease)</td>
<td>1.14</td>
</tr>
</tbody>
</table>
Handgrip Strength

- Low handgrip strength has been shown to be associated with:
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  - Functional disability
  - Osteoporosis
  - Premature death
Handgrip Strength

- Low handgrip strength has been shown to be associated with:
  - Diabetes
  - Heart disease
  - Dementia and Alzheimer’s disease
  - Functional disability
  - Osteoporosis
  - Premature death
    - Being weak was associated with a 40% greater risk for premature death

Handgrip Strength

- While low handgrip strength (weakness) is linked with many health complications...
  - How do we communicate low handgrip strength (weakness) as a risk factor to patients?
  - Poor use in clinical settings?
Handgrip Strength

• Current and future research trends:
  – Handgrip strength asymmetry (non-dominant handgrip strength (kg) / dominant handgrip strength (kg))
  – Clinically meaningful differences within measures
  – Technologies
  – Additional aspects of muscle function

Handgrip Strength

• What about physical activity?

• What about nutrition?

• What about health events and trajectories (e.g., hospitalizations, falls)
Handgrip Strength

• Convenient measure of muscle strength

• Powerful biomarker of aging

• Incomplete, but promise exists for change

• Routine (geriatric) health assessments

Thank You!

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Any Questions?
Case Examples

• Some research shown in the presentation suggested that many healthcare providers do not utilize clinical assessments of physical performance (e.g., handgrip strength, gait speed, etc.).

Do you utilize assessments of physical performance? Why or why not?

Case Examples

• An older patient without an age-related disability (e.g., ADLs) or morbidity (e.g., sarcopenia) was identified as having low handgrip strength, but not poor physical functioning (e.g., gait speed).

What would you recommend for this patient?