Nutrition Focused Physical Exam: Identifying Malnutrition

The application of hand grip strength in dietetic practice

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Content

- The equipment and methods used to assess hand grip strength
- The research relating to the use of hand grip strength and the assessment of nutritional status
- Relate this to dietetic practice
Jamar® Hydraulic Hand Dynamometer

Takei A5401 Digital Hand Grip Dynamometer £431

Also: Smedley Hand grip Dynamometer
Nottingham electronic dynamometer
Introduction

• Handgrip strength is useful as a test of skeletal function
• The test was developed by hand therapists
Indicator of concurrent and future status

Hand-grip dynamometry

Concurrent value
- Nutritional status/muscle mass
- Health status
- Physical function

Prognostic value
- Mortality
- Physical function
- Hospital length of stay

Bohannon (2015) page 468
The use of hand grip strength as a predictor of nutritional status in hospital patients

Change in mean percent ideal HGS (left) and mean PG-SGA score (right) between baseline and two weeks (n = 18). HGS: hand grip strength. PG-SGA: patient generated subjective global assessment. Patients who remained in or returned to hospital two weeks

Flood et al 2014
Visual representation of variables significantly associated with handgrip strength in the multivariate regression analysis model.

Silva et al 2014
Hypotheses for the pathogenesis of impaired muscle function in malnutrition.

Norman et al 2011
Recommended use in dietetics?

• For diagnosing ‘severe’ malnutrition (White et al 2012)
• Screening for malnutrition in patients with renal disease (Wright and Jones, 2010)
• Nutritional status and disease severity in adults with cystic fibrosis (Mead et al., 2014)
• Prognostic predictor in:
  • Haemodialysis patients (Isoyama et al., 2012)
  • Alcoholic liver disease (Plauth et al., 2006)
  • Liver disease (Alvares-da-Silva and Reverbel da Silveira., 2005)
• Potential to show impact of intervention (Gandy, 2014)
Application to dietetics

- Where changes in fluid status make BMI unreliable
- For auditing the outcome of our clinics
- Would like to use it more frequently
- Plan to review the values being used

Specialist areas
- Liver patients
- Haemodialysis patients
- Children and adults with cystic fibrosis
- GI Clinic
- Malnutrition in the elderly
Southampton protocol for adult grip strength measurement.

Roberts et al 2011
Measurement top tips

• Calibrate the equipment
• Set to kg
• Use the same method
• Standing or sitting does not seem to matter (see Dodds et al 2014)
• Dominant vs non dominant – studies vary
• Aiming to get the maximal grip strength
• Give patients time to get used to the equipment
• Compare to normative values for your population
Grip strength varies with different population groups

<table>
<thead>
<tr>
<th>Country</th>
<th>Sex</th>
<th>Age (y)</th>
<th>Handgrip kg (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malawi rural(^a) (284)</td>
<td>Male</td>
<td>55-59</td>
<td>32.3 (5.5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>60-69</td>
<td>29.0 (6.1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥ 70</td>
<td>25.9 (5.2)</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>55-59</td>
<td>22.9 (4.0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50-69</td>
<td>21.7 (4.9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥ 70</td>
<td>19.7 (3.2)</td>
</tr>
<tr>
<td>Thailand rural(^b) (244–280)</td>
<td>Male</td>
<td>60-69</td>
<td>31.4 (7.8)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>70-79</td>
<td>25.0 (6.3)</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>60-69</td>
<td>22.6 (4.7)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>70-79</td>
<td>19.7 (4.5)</td>
</tr>
<tr>
<td>India urban(^c) (1097)</td>
<td>Male</td>
<td>50-64</td>
<td>23.7 (6.5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥ 65</td>
<td>20.8 (6.5)</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>50-64</td>
<td>13.4 (4.5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥ 65</td>
<td>11.1 (4.2)</td>
</tr>
<tr>
<td>U.K. community(^d) (1023)</td>
<td>Male</td>
<td>65</td>
<td>34.8 (10.5)</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>65</td>
<td>20.0 (6.8)</td>
</tr>
</tbody>
</table>

Table 16.13: Mean handgrip strength in four populations. Data from: \(^a\)Chilima (1998); \(^b\)Varaksmin et al. (1998); \(^c\)Manandhar (1999); \(^d\)Finch et al. (1998).

Standards in use in practice

Gandy (2014) Page 54

Todorovic and Micklewright (2011) page 2.21

<table>
<thead>
<tr>
<th>Normal values (kg)</th>
<th>85% of normal (values at or below this level are indicative of protein malnutrition) (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Men</strong></td>
<td></td>
</tr>
<tr>
<td>18–69 years</td>
<td>40.0</td>
</tr>
<tr>
<td>70–79 years</td>
<td>32.5</td>
</tr>
<tr>
<td>80+ years</td>
<td>22.5</td>
</tr>
<tr>
<td><strong>Women</strong></td>
<td></td>
</tr>
<tr>
<td>18–69 years</td>
<td>27.5</td>
</tr>
<tr>
<td>70–79 years</td>
<td>25.0</td>
</tr>
<tr>
<td>80+ years</td>
<td>20.0</td>
</tr>
</tbody>
</table>

Technique: Squeeze as hard as possible on three occasions using the non-dominant arm. The highest reading should be taken.
Cross-cohort centile curves for grip strength.

Dodds et al 2014

Dodds RM, Syddall HE, Cooper R, Benzeval M, Deary IJ, et al. (2014) Grip Strength across the Life Course: Normative Data from Twelve British Studies. PLOS ONE 9(12): e113637. doi:10.1371/journal.pone.0113637
http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0113637
Clinical application

• Klidjian et al 1980 propose 85% of normative value by age which is equivalent to 1 SD

• *Having grip strength comparable to younger adults is more desirable than having grip strength comparable to other older adults whose strength has also declined with age’* (Bohannon 2015)

• Dodds et al 2014 propose -2.5 SD from the maximal value to define a weak grip

<table>
<thead>
<tr>
<th>Men</th>
<th>Maximal</th>
<th>-2.5 SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>51.9</td>
<td>27</td>
<td>(23% aged 80)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Women</th>
<th>Maximal</th>
<th>-2.5 SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>31.4</td>
<td>16</td>
<td>(26.6% aged 80)</td>
</tr>
</tbody>
</table>
Country setting of included samples by UN region.

Dodds et al. 2016

© The Author 2016. Published by Oxford University Press on behalf of the British Geriatrics Society.
Grip strength mean values from included samples, by UN region.

Dodds et al. 2016
Use in research as a dietetic intervention outcome measure in adults

(hand grip strength or dynamometry)
AND
(nutritional assessment or nutritional status)
AND
(nutritional intervention)
2007-2016

• 15 accessible
• 12 RCT
• One prospective
• One SR
• One meta-analysis

• 60% (9) showed improvement
• 80% (12) referred to a specific dynamometer
Research outcomes

% of studies (n12) by population area and positive outcome

% of studies

Population area

Intervention improved grip strength

Nutrition support
Free living
Older people
Type of service
Nursing home
Hospital
Cancer
COPD
HIV

Intervention improved grip strength
Effects of food fortification on nutritional and functional status in frail elderly nursing home residents at risk of malnutrition

Fig. 2. Handgrip strength (kilograms) was maintained after 12 wk of intervention in the FF group but decreased in the standard group. However, the difference between groups was not significant. Box plots indicate minimum, maximum, and 25th, 50th, and 75th perc...

Smoliner et al 2008
Conclusion

• Standard method
• Normative values for your community
• Use 1 SD to define weak grip
• Simple ‘bedside’ / clinical parameter
• Useful in dietetics as a tool to monitor nutritional status
• Alongside other methods


