

# GRIPABLE

SERIOUS. FUN. REHAB.

## How strong are you?

How strong are you and why does it matter? Grip strength has long-since been used as a measure by therapists to understand function or track improvement following a hand injury. However, in recent years, evidence has been growing that grip strength is correlated to total muscle strength in typically developing children and adults<sup>1,2,3</sup> as well as being a strong indicator of health status<sup>4</sup>.

Richard Bohannon, in his excellent article in 2019, found evidence for grip strength as a biomarker in a wide variety of different clinical applications. There has been research demonstrating that grip strength can be used to represent other muscle actions in both healthy adults and those with some pathologies. For example, there has been a confirmed association between decreased grip strength and hip fractures<sup>5</sup>, fragility fractures<sup>6</sup> and falls<sup>7,8</sup>. Other interesting emerging associations include diabetes<sup>9,10,11,12</sup>, stroke outcome<sup>13,14,15</sup>, and cardiometabolic musculoskeletal conditions<sup>16</sup>. Research has also been carried out in large populations around the world each trying to establish all-cause mortality and drop in grip strength. Several meta-analyses analyse these studies. Wu<sup>17</sup> et al calculated the pooled hazard ratio of 1.16 for every 5kg drop in grip strength and Garcia-Hermosa<sup>18</sup> et al concluded that the pooled hazard ratio for reduced mortality was 0.69 for those that have higher grip strength. An extraordinary study by Leong et al<sup>19</sup> found that grip strength was a stronger predictor of cardiovascular mortality than systolic blood pressure.

All this evidence leads clinicians to rethink the role of measurement of grip strength in primary and secondary care. Dynamometers are the most commonly used tool for measurement of single maximum voluntary grip strength (SMGT) testing and the most universally adopted device used for this is the Jamar (or equivalent) dynamometer. It has been heavily researched since its inception in the 1950s and has proven reliability and validity, so long as strict testing procedures are in place. However, this dynamometer is heavy, altered results are produced depending on arm and body position, narrative and other variables. Additionally, on the standard hydraulic dynamometer, it is also challenging to get an accurate reading at the lower end of the strength register. There is limited evidence to link SMGT to function. Sunderland<sup>20</sup> did show a strong correlation with a few functional measures in participants post stroke and Bohannon showed the power of grip strength to predict future function<sup>21</sup> but other papers suggest the link between grip strength and hand function is poor<sup>22,23</sup> and there has been a proposal that being able to measure alternative aspects of grip strength, such as longer sustained grip strength and endurance of repeated grips might give further insights<sup>22,23</sup>. Very little research has been carried out exploring this and one reason is the lack of reliable, sensitive and readily available tools to use to make these measurements.

With the development of GripAble, built on the excellent reliability research around grip strength testing, measurement of a wider range of grip strength is easy in a clinical environment. This technology-led device comprises a hand-held sensor designed to ergonomically fit the hand which links, via Bluetooth, to a tablet and proprietary software. The grip tests are an integral part of the platform with an intuitive interface. Each of the five currently available grip tests (SMGT, multi-position grip test, sustained grip test, endurance grip test and the rapid exchange test) have built in pre-determined positional and process guidelines plus standardised narrative to ensure all clinicians follow the exact same

application. Once the end user has been registered on the software, the results are automatically saved and can be sent for inclusion in medical records. Each test result is presented with appropriate automatic calculations including mean, standard deviation and comparison of right to left hands. In preliminary studies, this device, GripAble, has excellent correlation with the Jamar dynamometer at ICC 0.90, has outstanding sensitivity at about 67g and is highly accurate across the range of detectable strengths from 0 to 90kg. This is slightly different in isotonic to isometric modes but within the parameters given for the Jamar. Additionally, GripAble has shown excellent robustness in drop tests over 1.5m. Two papers are being published imminently giving detail of these results.

From the above evidence, you can see that how strong you are does matter. Grip strength is a strong biomarker and predictor of outcome. Perhaps it is time we all had our grip strength tested regularly?

### **About the author**

Nicola Goldsmith is clinical director at GripAble, focused on ensuring the therapist and user are central to product development. A highly specialised hand therapist, Nicola is a partner at NES Hands and current President of the International Federation of Societies for Hand Therapy (2019-2022).



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