

Dynamometer Calibration Records Description

The hand dynamometers in use at UK Biobank assessment centres were calibrated externally. This resource makes the calibration data available to researchers. Each dynamometer is listed by its UKB_ID, which is the same as the Device ID listed in Showcase data field 38.

The standard recommendation is that Jamar dynamometers should be calibrated yearly when in regular use. In 2008 it was decided to calibrate those dynamometers in heavy use every six months. In many cases, the dynamometers were also sent for calibration before being shipped to a different assessment centre. New dynamometers were considered to be correctly calibrated during manufacture, so there are no calibration records at the start of use.

UKB processes specify that each dynamometer in use should be checked daily by clinic staff. This is a check that the dial moves when the dynamometer is squeezed and that the pointer returns to zero when the dynamometer is released. When clinic staff detect an issue then a dynamometer is removed from use. It might be sent for an extra calibration at that time, or it might be stored unused until its next scheduled calibration.

Records exist from three different calibration companies. The format of the calibration certificates varies with company and over time. The CalibrateUK and Lafayette certificates state only whether the dynamometer passed or failed. Some of the Glanford certificates include records of the values. Tests are performed at 10, 30, 50, 70 and 90 kg. To be classed as a pass, each of the test values must be within 1.8 kg of the correct value. Dynamometers are often adjusted slightly even though they have passed. This can be seen in an optional adjustment comment recorded by the tester.

Among failure records, they often show a constant-value error across the testing range. However, this is not universal, and a few records show a negative error at one test value and a positive error at another test value.

Where the pre-adjustment values are recorded, they are formatted in two possible ways. Either the standard input such as 10 kg is applied, and the corresponding reading on the dynamometer dial is recorded, or sufficient input is applied to produce a standard reading such as 10 kg on the dynamometer dial, and the size of the input is recorded.

Three different tsv files are provided in this resource. One file has the records that state only pass/fail or an adjustment comment, with no test values shown. Another file has the records that show values at standard input weights. The last file has the records that show values for standard readings.

An issue has been identified with the grip strength data collected in Cheadle during 2013 (instance 1). We are working on modelling a correction factor. In the meantime, researchers are advised to treat the 2013 grip strength data with caution. In particular, readings from dynamometer 7336 are distinctly lower than they should be. The average error is approximately 2 kg for readings taken in January 2013, gradually worsening to an average error of 14 kg for readings taken in June 2013. The dynamometer was out of use after June 2013 until it was recalibrated on 5/4/ 2017, and there is no evidence of problems with dynamometer 7336 during instances 0, 2 or 3.

The 5/4/2017 calibration record for dynamometer 7336 shows it failing badly, but apparently in the wrong direction. This may be a recording error on the part of the tester.

As Found

Input Force (kg)	10.00	30.00	50.00	70.00	90.00
Reading (kg)	18.2	38.5	58.6	78.7	98.6
Error	9.11%	9.44%	9.56%	9.67%	9.56%

As Left

Input Force (kg)	10.00	30.00	50.00	70.00	90.00
Reading (kg)	10.0	30.0	50.0	70.1	90.2
Error	0.00%	0.00%	0.00%	0.11%	0.22%