

Utilization of a Novel Digital Device and an Analytic Method for Accurate Measurement of Upper Extremity Motor Function

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BACKGROUND: Existing methods to measure upper extremity performance are highly subjective. We utilize a novel digital device, the MediSens Handgrip, to objectively quantify the handgrip dexterity of patients with cervical spondylotic myelopathy (CSM). **OBJECTIVE:** To verify the efficacy of the MediSens Handgrip that its metric can (i) distinguish patients from the controlled subjects and (ii) assess changes in motor function pre- and post-operatively following surgical decompression. **METHOD:** This is a pilot study with 7 patients (mean age 62.3 ± 13.1) and 28 healthy subjects (mean age 55.6 ± 8.0). The test was performed once preoperatively and at three months postoperatively. Patients are tasked to track a sine waveform by varying their grip strength. The test results are analyzed using a machine learning algorithm to find the optimal metric that best separates the patient's preoperative data from healthy subjects. The computed metric of postoperative data, which is a non-linear combination of mean absolute error and second harmonic frequency, was then compared against patient's reported Oswestry Disability Index (ODI). **RESULTS:** The mean classification accuracy between the preoperative patient data and controlled data was 92.01%. The patient's postoperative data was categorized into *functional* and *non-functional* group based on their ODI. The proposed metric achieved 100% accuracy in classifying these postoperative data. Moreover, a linear relationship between the postoperative metric and the ODI was observed ($p = 0.087$). **CONCLUSION:** Our preliminary results show the Medisens Handgrip can be useful for quantifying the level of motor dexterity and measuring the functional progress. Such knowledge may be used in the clinic setting to assess the need for surgical intervention and predict surgical success.

References:

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