Project of playul and automatized assessment of motor function in patients with NMD: MFM-Digital study


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The Motor Function Measure (MFM) is a validated and sensitive tool composed of 32 items, applicable to ambulant and non-ambulant patients with neuromuscular disorders (NMD). It is currently used as outcome measure in clinical studies. By using digital technologies, we want to create an automated MFM assessment. The objectives are to improve the MFM reliability and its acceptability by including the assessment in a serious game. Feasibility studies assessing the relevance of digital systems to capture postures and motions during a MFM test have shown that on 32 items of the MFM, 14 could be captured by the Kinect and 3 by a digital tablet. Here we present studies to the conception of the assessment with digital tools.

### RESULTS MFM-KINECT

119/140 records were interpretable. Some digital data were not analyzed because of capture problems with distortion skeleton. For example, patients with small amplitude movements or sitting on a wheelchair were hardly capture.

**MATERIAL and METHOD**

- Patients with Spinal Motor Atrophy (SMA) type 2 or 3 (study 1: 10 from the Escale department and study 2: 14 from the NaTHis-SMA study - NCT02391831) were included in the MFM-Kinekt study. 14 items were scored by a therapist through standard MFM completion and from a blind scoring based on digital data coming from Kinect.
- Patients with a NMD from 5 neuromuscular disorder departments were included in the MFM-Tablet study. Items 18, 19 and 22 were scored by a therapist through standard MFM completion on paper or using a digital tablet application.

Interface mods Kimeto, a software developed by the Q-SCOP laboratory to record Kinect data and analyze items.

**RESULTS MFM-DIGITAL TABLET**

99 patients were included in the MFM-tablet study, with 25 DMD, 17 SMA, 15 Myotonic Dystrophy, 13 Progressive Muscular Dystrophy, 9 Neuropathies and 20 others.

Median age of patients were 161.1 year [IQR: 11.3 -43.9] and median MFM total score were 77.1% [IQR: 53.1 - 85.4]. The agreement between scoring on paper vs tablet is excellent (>= 0.81) for items 18 and 22, good (k =0.61-0.8) for item 19.

<table>
<thead>
<tr>
<th>Item 18</th>
<th>Item 19</th>
<th>Item 22</th>
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<tbody>
<tr>
<td>91.9</td>
<td>73.7</td>
<td>97.0</td>
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<td>0.93</td>
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### DISCUSSION and CONCLUSION

Results are encouraging to support the development of an automated MFM. Additional work is needed to improve Kinect capture for weaker patients and to find new digital technologies able to capture additional items. In study 2, MFM-Kinetk protocol was included in a long list of tests during NaTHis-SMA, which could explain result differences between studies.

The MFM-tablet results validate the use of a tablet during the completion and give us the possibility to included it easily in a game, particularly for children who showed a greater interest for the tablet application. The next steps are to implement algorithms to provide an automated scoring based on digital data to help the therapist to score and to turn the assessment in a playful scenario in order to improve engagement of children.


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