Developing non-invasive, objective assessment tools for social apathy in Neurocognitive Disorders: the role of action kinematics

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BACKGROUND

Apathy, a reduction in goal-directed activities in the domains of behavior/cognition, emotion and social interaction, is a prominent behavioral symptoms in Neurocognitive Disorders (NCD) [1]; Apathy assessment often relies on self-reports or clinical scales, which are subjective. Growing attention is devoted to defining more objective, measurable and non-invasive apathy proxies.

Here we investigated the interest of assessing action kinematics in a short reach and grasp protocol [2] for the assessment of social apathy, a reduction in the willingness to interact with others.

METHODS

Participants

19 subjects with Mild NCD recruited at the Nice Memory Center (CMRR, CHU of Nice);

Based on the Apathy Motivation Index (social motivation subscale, cut-offs reported in [3]), subjects were classified as socially apathetic (N=9) vs non-apathetic (N=10).

Apathetic and non-apathetic subjects did not differ concerning age, gender, global cognitive impairment (MMSE) and executive functions (FAB) - see Table 1.

<table>
<thead>
<tr>
<th>Apathetic (N=9)</th>
<th>Non-apathetic (N=10)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>77.44 ± 4.90</td>
<td>74.20 ± 7.19</td>
</tr>
<tr>
<td>Gender (N)</td>
<td>6 F, 3 M</td>
<td>7 F, 3 M</td>
</tr>
<tr>
<td>MMSE</td>
<td>25.56 ± 3.05</td>
<td>26.4 ± 2.99</td>
</tr>
<tr>
<td>FAB</td>
<td>15.56 ± 2.40</td>
<td>15.40 ± 1.90</td>
</tr>
<tr>
<td>AMI – Total</td>
<td>1.63 ± 0.40</td>
<td>1.00 ± 0.35</td>
</tr>
<tr>
<td>AMI – Social Motivation</td>
<td>2.33 ± 0.58</td>
<td>1.07 ± 0.51</td>
</tr>
</tbody>
</table>

MMSE = Mini-Mental State Examination (Folstein et al., 1975); FAB = Frontal Assessment Battery (Dubois et al., 2000); AMI = Apathy Motivation Index (Anf et al., 2017).

Significance level for the Mann-Whitney or Chi² tests: * p< 0.05; ** p< 0.01; *** p< 0.001

Materials and procedures

Subjects were asked to reach and grasp a can to: place it into a cup (individual condition, IND) pass it to a partner (social condition, SOC).

Each condition was repeated 10 times; the order of conditions was randomized.

SensRing, a novel ring-shaped wearable sensor [4], was placed on their dominant hand’s index finger.

RESULTS

Kinematic features, such as jerk and movement velocity, were extracted from SensRing to assess motor performances in both groups in the SOC and IND conditions;

Non-apathetic subjects showed a significantly a lower root mean square of jerk (p=0.038) and a lower peak velocity (p=0.009) in the social (SOC) vs individual (IND) condition when moving the object to the final position;

Apathetic subjects showed no significant differences between conditions in any of the extracted features.

CONCLUSIONS

Previous studies showed the interest of recording weekly motor activity for apathy assessment. Here we showed that a 5-minutes reach and grasp protocol can show differences between socially apathetic and non-apathetic subjects with Mild NCD, thus providing a tool easily usable in the clinical practice. Future studies with a bigger sample are needed to better characterize these findings.

References & Acknowledgements


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Figure 1. SensRing sensor, and experimental conditions.

Figure 2. Jerk and peak velocity for socially apathetic vs. non apathetic subjects in the individual (IND) and social (SOC) conditions. Error bars represent standard errors. * p< 0,05 at Mann-Whitney Test, **p< 0.01 at Mann-Whitney test.

Non-apathetic subjects showed slower and smoother movements in the social condition, thus suggesting a more careful approach when passing the object to another person. This was not the case for socially apathetic subjects, who showed no significant modulation of action kinematics in a social vs. individual context.