

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-aphathetic (N=10)**.
- ⇒ Apathetic and non-aphathetic subjects did not differ concerning age, gender, global cognitive impairment (MMSE) and executive functions (FAB) - see Table 1.

	Apathetic (N=9)	Non-aphathetic (N=10)	p
Age	77,44 ± 4,90	74,20 ± 7,19	0,250
Gender (N)	6 F, 3 M	7 F, 3 M	0,876
MMSE	25,56 ± 3,05	26,4 ± 2,99	0.581
FAB	15,56 ± 2,40	15,40 ± 1,90	0.731
AMI – Total	1,63 ± 0.40	1,00 ± 0,35	0.004*
AMI – Social Motivation	2,33 ± 0,58	1,07 ± 0,51	<0.001***

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). p= significance level for the Mann-Whitney or Chi² tests. * p< 0,05; *** p< 0,001

Table 1. Participants' demographic and clinical features

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.

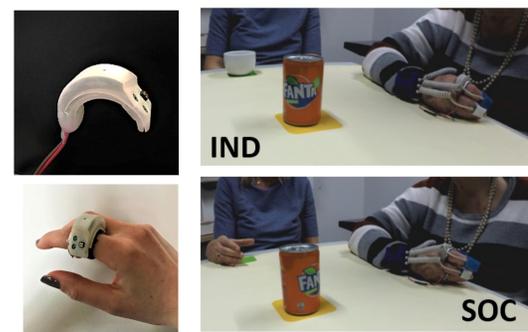


Figure 1. SensRing sensor, and experimental conditions.

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-aphathetic** 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.

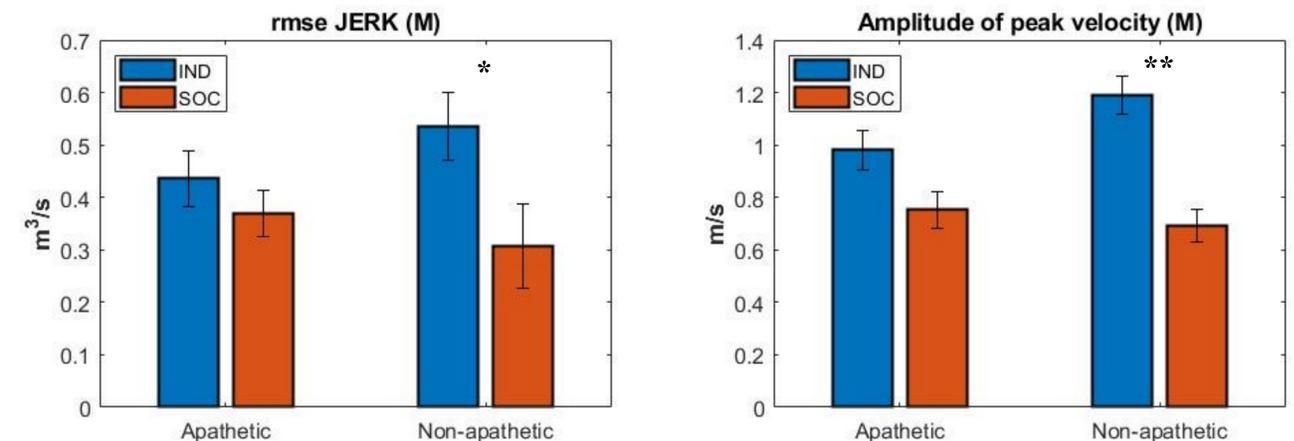


Figure 2. Jerk and peak velocity for socially apathetic vs. non-aphathetic subjects in the individual (IND) and social (SOC) conditions. Error bars represent standard errors. * p< 0,05 at Mann-Whitney Test; **p< 0,01 at Mann-Whitney test.

- ⇒ **Non-aphathetic** 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.

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-aphathetic 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

[1] Manera et al., 2019, doi.org/10.1002/gps.5125. [2] Becchio et al., 2008, doi.org/10.1016/j.concog.2007.03.003. [3] Ang et al., 2017, doi:10.1371/journal.pone.0169938. [4] Rovini et al., 2020, EMBC-2020.

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