Smartphone-mediated neurobehavioral testing as a digital biomarker for neuropsychiatric conditions

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**Introduction**

Neurobehavioral assays of brain function typically require in-lab testing with bulky equipment and instruments attached to the participant’s face, making it hard to use as diagnostic instruments in daily clinical practice.

We have developed a smartphone-based platform to perform neurobehavioral testing in a wide range of environments. With this platform, verbal and/or tactile interaction is not necessary, allowing for large-scale translational cross-cultural human studies and a translation on cross-species research.

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**Eyeblink Conditioning (EBC)**

Eyelid closure

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**Remote testing**

Remote experimenter

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**Eyelid and other facial landmark detection**

Participant

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**Our Smartphone Method**

Remote data collected with smartphone app

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**Eye closure**

Raw data collected with smartphone app

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**Prepulse Inhibition (PPI)**

Prepulse inhibition (PPI) measures the ability to filter out irrelevant information through sensorimotor gating. We used a 50 ms white noise audio burst at 105 dB as the pulse and at 65-95 dB as the prepulse.

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**Prepulse Inhibition in Autism and ADHD**

Normal PPI in neurotypical group

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**Startle Habituation (HAB)**

Startle habituation (HAB) measures the ability for the intrinsic damping of repetitive stimuli. In the HAB paradigm, we employed a pulse train of 50 ms, 155 dB white noise at 0.7 Hz.

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**References**

- Eyeblink conditioning (EBC) published by Princeton Neuroscience Institute, 2 Erasmus University MC, Lund University, and C2 engage with BlinkLab Pty Ltd as co-founders and equity holders. The remaining authors declare no competing interests.
- Smartphone-mediated neurobehavioral testing as a digital biomarker for neuropsychiatric conditions.
- Smartphone neurometric tests include:
  - Eyeblink conditioning (EBC)
  - Prepulse inhibition (PPI)
  - Startle habituation (HAB)
  - Any other tests that uses visual, auditory and/or tactile stimuli and measures facial responses (e.g. oddball test).

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