How can a game-based approach improve the assessment and understanding of Autism Spectrum Disorder (ASD) across cognitive and motor domains?

Autism Spectrum Disorder (ASD) is a complex neurodevelopmental condition affecting approximately 1 in 160 children globally (WHO, 2021). It is characterized by impairments in social interaction, communication, and repetitive or restrictive behaviors. Despite advances in understanding the neurobiological and cognitive mechanisms underlying ASD, its diagnosis, particularly in adults and across diverse populations, remains challenging. Traditional assessment methods such as questionnaires (e.g., Social Responsiveness Scale) or resource-intensive approaches like EEG and fMRI are limited in accessibility and scalability.

Emerging evidence suggests that interactive, touch-based games can provide valuable insights into cognitive and motor domains, offering a promising alternative for ASD assessment. For example, motor performance variability in tablet-based games has been linked to early indicators of ASD. Such gamified approaches, designed to address specific cognitive domains like attention, memory, and motor execution, could offer cost-effective, engaging, and culturally adaptable tools for early screening and long-term monitoring of ASD.

This challenge seeks to explore how a gamified, multi-domain assessment can be developed and validated as an effective tool for ASD research and intervention.

Available Data and Resources

1. **Behavioural and Cognitive Data:**
    - Existing research on motor and cognitive deficits in ASD (e.g., Theory of Mind, executive dysfunction).
    - Published datasets on motor performance variability in ASD children during interactive tasks.
2. **Technological Infrastructure:**
    - Neurometry's existing digital health platform and preliminary tablet app architecture for data collection.
    - Access to device-integrated data on digital biomarkers, including cognitive and motor performance metrics.
3. **Collaborative Network:**
    - Potential collaborators include experts from University of Kent, UCL Neuroscience and Psychology, and University of Bern Psychiatric Hospital.
    - Preliminary feedback from special needs schools, charities, and paediatric hospitals that have engaged with similar research.

Questions to Tackle During the Meeting

1. **Assessment Validity:**
    - How can we design and validate a gamified tool that addresses key cognitive and motor domains (e.g., attention, problem-solving, motor execution) for ASD assessment?
    - What methods can ensure cross-cultural adaptability and accessibility of this tool?
2. **Data Integration and Analysis:**
    - How can game-based data (e.g., reaction times, error rates, variability) be used to develop robust digital biomarkers for ASD diagnosis?
    - Can computational neuroscience models effectively integrate behavioural and motor data to predict ASD-related traits or severity?
3. **Implementation Challenges:**
    - What ethical considerations should be addressed for deploying game-based assessments in neurodevelopmental research?
    - What regulatory pathways are suitable for certifying such a tool as a clinically valid Class 1 device or Health Performance tool?

Research Skills Required

1. **Neurocognitive Data Analysis:** Expertise in analysing multi-domain cognitive and motor performance data using computational neuroscience and ML models.
2. **Game Design and Development:** Experience in designing engaging, interactive tasks tailored to neurodiverse populations, particularly children.
3. **Digital Health and App Development:** Knowledge of app development for data collection and integration with digital health platforms.
4. **Collaborative Research:** Ability to integrate findings from multidisciplinary teams, including cognitive neuroscientists, engineers, clinicians, and data scientists.

Thank you,

Omair Ahmed, CEO

Egor Levchenko, UCL PhD Candidate

Rhiannon Wickenson, Kings College Medical