TBI MOTOR RECOVERY

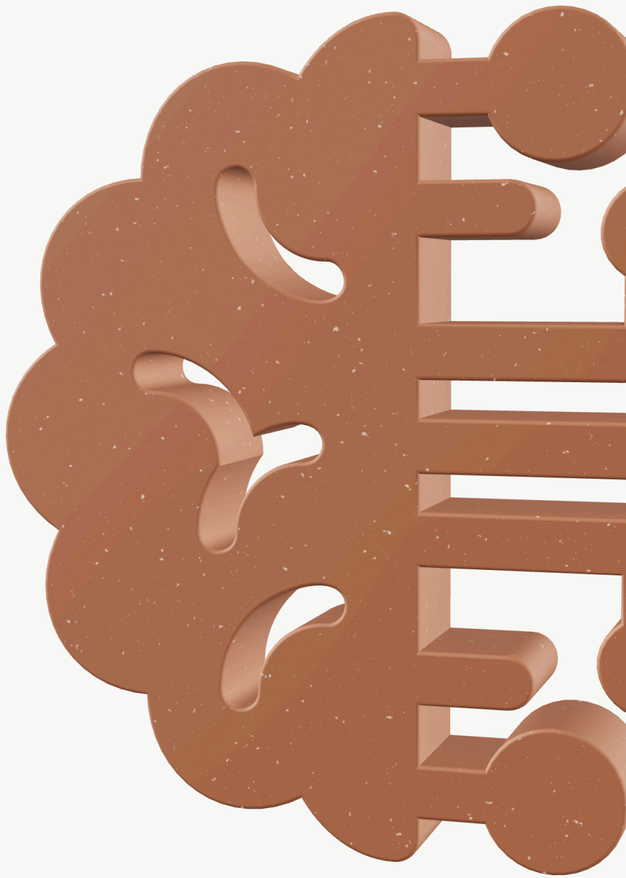
TRAUMATIC BRAIN INJURY
RECOVERY AID

Eric Balanecki, Jan Smailbegovic, Callum Mackenzie

THE PROBLEM

TRAUMATIC BRAIN INJURY (TBI) OFTEN LEAVES PATIENTS WITH LINGERING MOTOR AND COGNITIVE DEFICITS

- Many TBI patients experience **impaired fine motor skills**, limiting daily activities
- **Traditional therapy** is *time-consuming*, *inconsistent*, and often **inaccessible outside clinics**
- **Lack of feedback makes it difficult** for patients and clinicians to track improvement



IMPROVED OUTCOMES

With **more consistent, accessible practice,** TBI outcomes significantly improve.[1]

Our solution provides:

- Structured, **data-driven motor drills** that can be used early and consistently
- **Personalized progression** with measurable outcomes
- **Accessiblity** both **at home** and in clinic

TECHNICAL ARCHITECTIRE

FRONTEND

- Personalized **AI-powered exercise plan**
- **Data-centric UI** with React/Next.js
- **Eye tracking** for exercises
- Fine **motor exercises** with three.js
- Bluetooth connectivity to accessibility hardware
- **Heart rate aware rest** breaks to avoid overstimulation
- Personal **AI recovery** chat interface

BACKEND

- **OpenAI API** for exercise selection and exercise feedback generation
- **Python FastAPI** for seamless integration
- **Secure document database** for data persistance
- **Data parsing** to return valid results

IMPACT

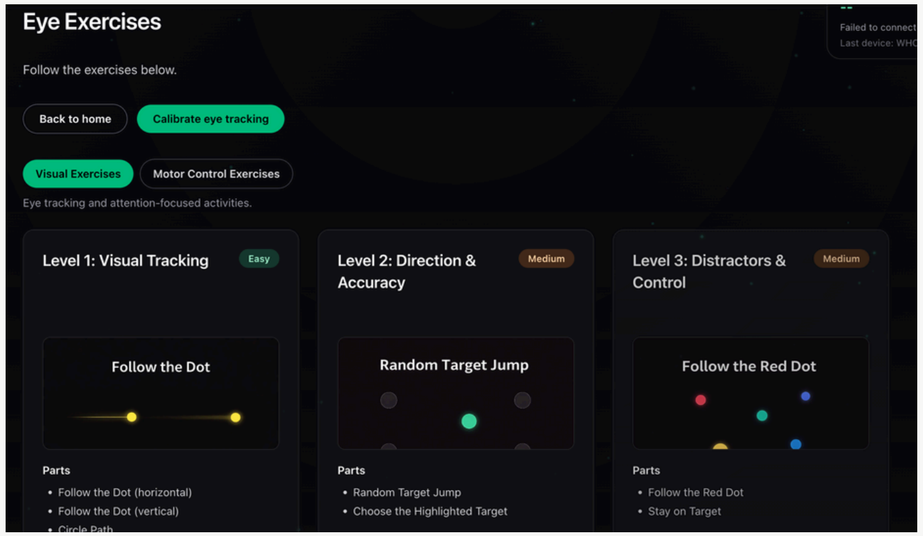
With consistent fine motor and concentration practice:

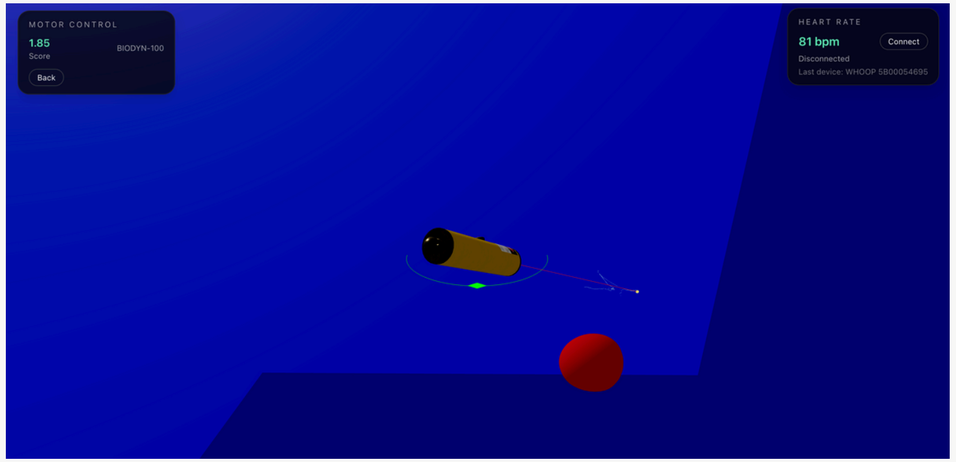
- Consistent, structured drills **accelerate fine motor skill improvement**
- Adaptive, **gamified exercises motivate patients** to practice more consistently
- Real-time **tracking allows clinicians to monitor** therapy
- Improved **motor skills support independence** and quality of life

WHAT'S NEXT?

- **Adding more targeted drills** past fine motor control; ie. language, problem solving, ...
- **Integrating clinicians** to provide access to patient data summaries **for informed care**
- **Gather clinical data** to validate effectiveness and inform best practices
- **Further use of AI-enhanced performance metrics** to automatically adapt drill difficulty for each patient

A PEEK INSIDE





THANKS!

Eric Balanecki, Jan Smailbegovic, Callum Mackenzie

References
1) https://pubmed.ncbi.nlm.nih.gov/40958454/