

TBI MOTOR RECOVERY

TRAUMATIC BRAIN INJURY
RECOVERY AID

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
- **Accessibility** both **at home** and in clinic



TECHNICAL ARCHITECTURE

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

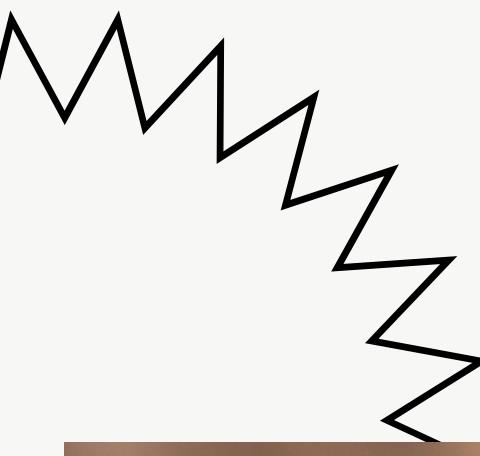
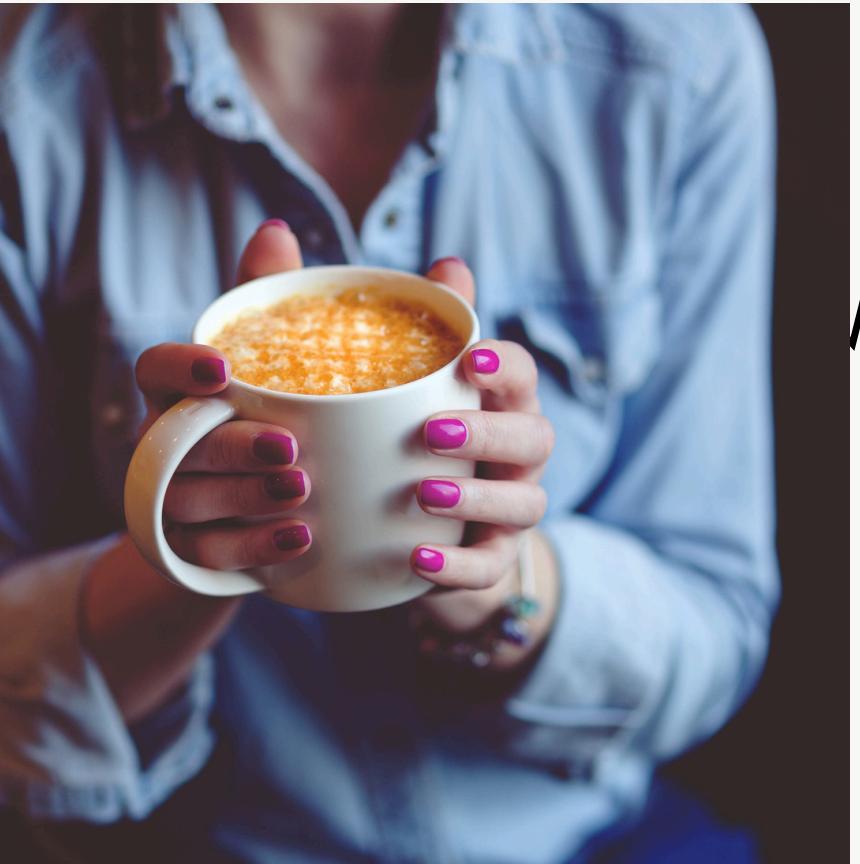
BACKEND

- **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

Eye Exercises

Follow the exercises below.

[Back to home](#) [Calibrate eye tracking](#)

[Visual Exercises](#) [Motor Control Exercises](#)

Eye tracking and attention-focused activities.

Level 1: Visual Tracking Easy

Follow the Dot

Parts

- Follow the Dot (horizontal)
- Follow the Dot (vertical)
- Circle Path

Level 2: Direction & Accuracy Medium

Random Target Jump

Parts

- Random Target Jump
- Choose the Highlighted Target

Level 3: Distractors & Control Medium

Follow the Red Dot

Parts

- Follow the Red Dot
- Stay on Target

TBI Motor Recovery

Failed to connect
Last device: WHOOP 5B00054695

WHO IT HELPS
Built for people with TBI who want to rebuild visual and motor control.

WHAT IT TRAINS
Visual tracking, reaction time, attention shifting, and hand-eye coordination.

HOW IT FEELS
Low-pressure sessions with clear feedback and repeatable routines.

WHAT YOU SEE
Simple progress snapshots so you can notice small improvements.

HOW IT FITS
Short exercises that can be repeated daily without cognitive overload.

WHY IT WORKS
Consistent practice builds stability, accuracy, and confidence over time.

TOTAL SESSIONS 0

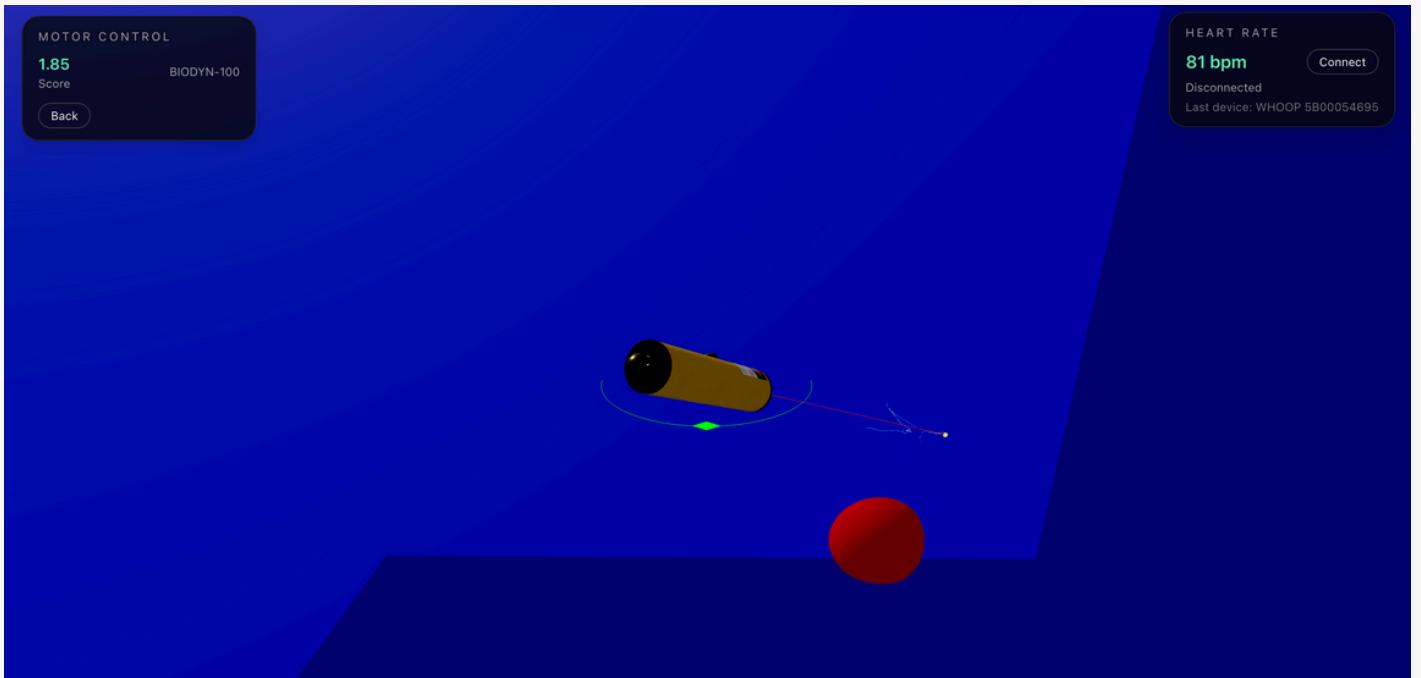
AVERAGE SCORE --

BEST SCORE --

LATEST SESSION --

Overall progress
Average score across all exercises.

Accuracy improvement
Level 1 visual tracking accuracy over time.



THANKS!

Eric Balanecki, Jan Smailbegovic, Callum Mackenzie

References

- 1) <https://pubmed.ncbi.nlm.nih.gov/40958454/>