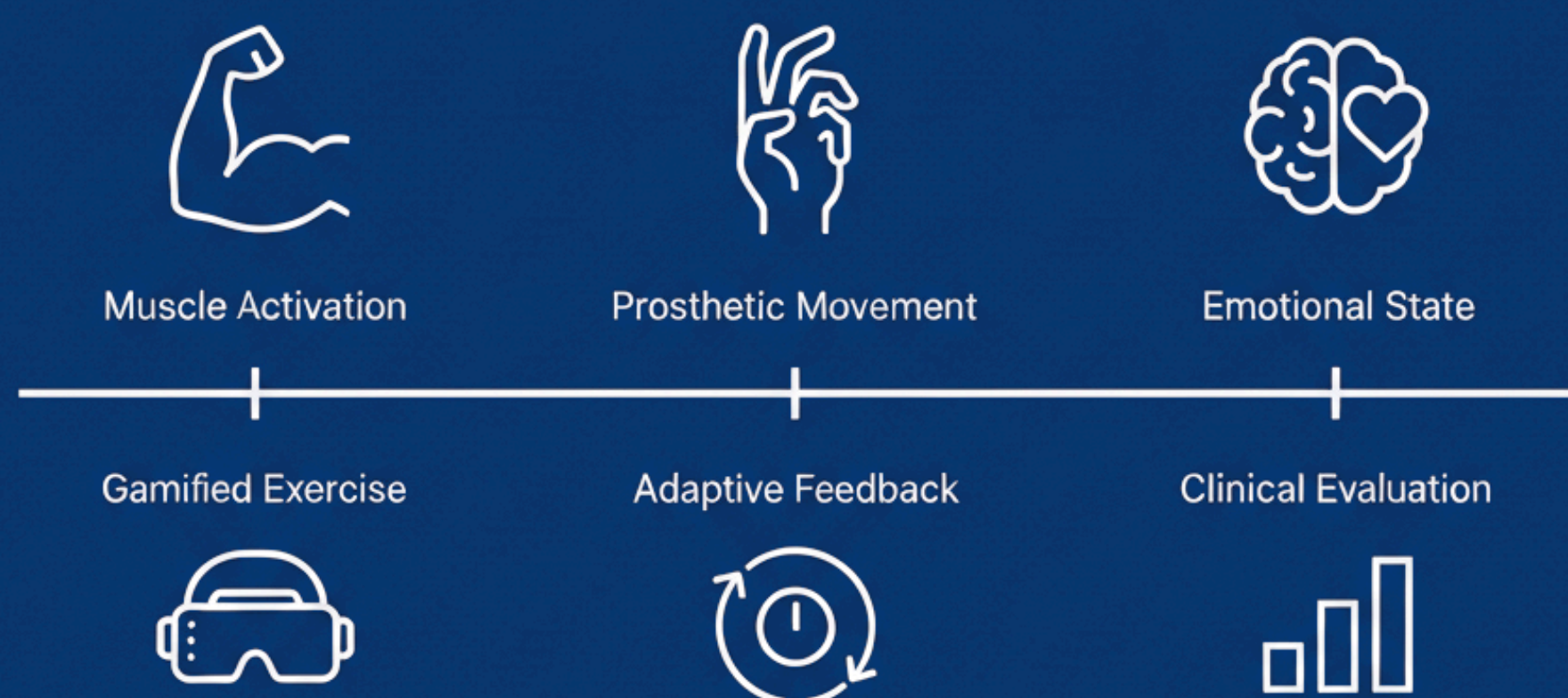


EMBODY

Children with upper-limb differences frequently struggle to adapt to myoelectric prostheses, with high paediatric **rejection rates of 35–45%** are linked to discomfort, limited functional benefit, and difficulties during early training. To address limited engagement and support in early rehabilitation, EMBODY was developed as a gamified, emotion-aware digital system that supports myoelectric training through clinically informed movements, adaptive feedback, and interactive tasks designed for children.

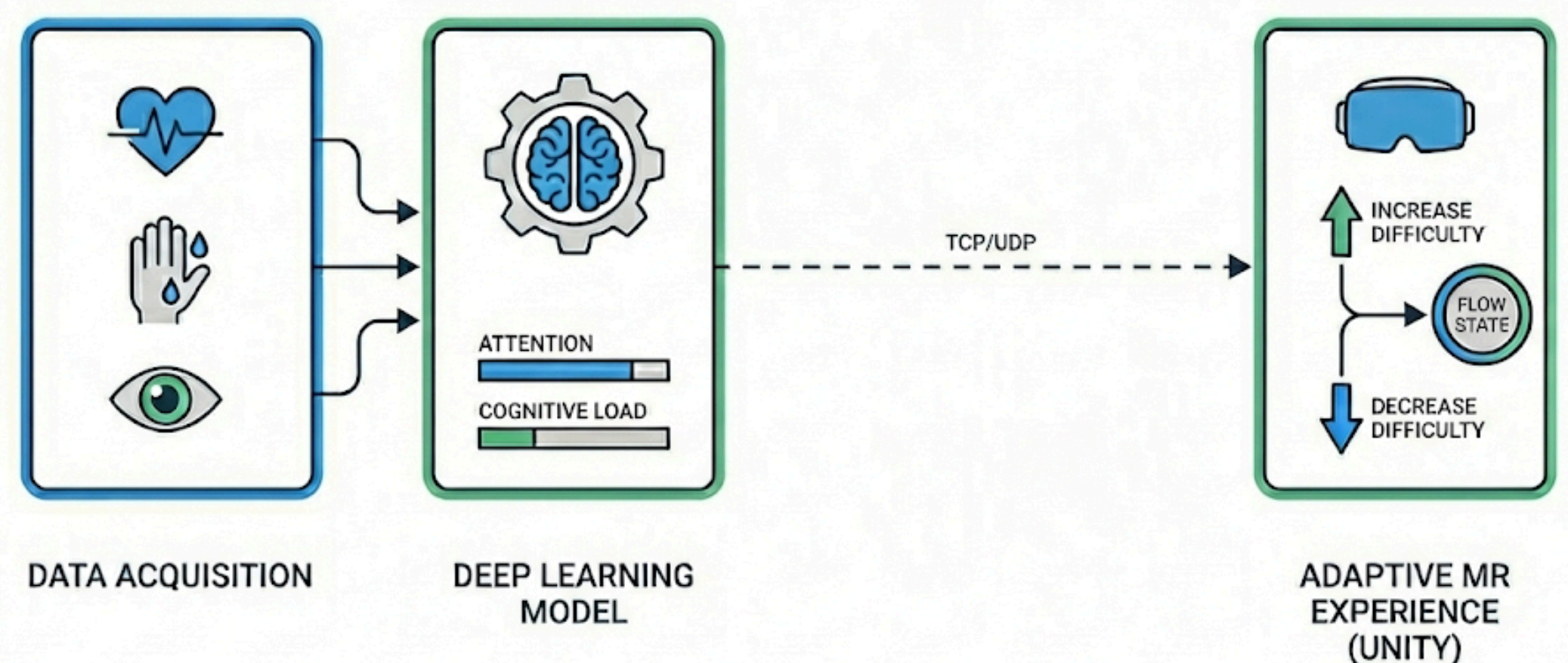
1 Objective

1. **Enhance Gesture Accuracy** – Improve tracking precision for diverse hand movements
2. **Improve Muscle Coordination** – Adaptive exercises to strengthen motor control and flexibility
3. **Increase User Engagement** – Gamified, immersive virtual environments to sustain motivation
4. **Enable Personalized Training** – Adaptive learning with real-time emotion recognition
5. **Promote Functional Independence** – Simulated daily tasks to improve real-world hand use



2 Methodology

- **Real-Time Biometric Capture** – HRV, EDA & eye-tracking recorded during task performance
- **Signal Preprocessing** – Noise removal and normalization of physiological inputs
- **Deep Learning Inference** – Model computes Attention & Cognitive Load scores
- **AR Integration** – Cognitive metrics transmitted to Unity-based rehabilitation environment
- **Dynamic Difficulty Adjustment (DDA)** – Cognitive scores mapped to game parameters
- **Closed-Loop Optimization** – Task complexity continuously adjusted to maintain optimal Flow State



5 Conclusion

This system tackles challenges in upper-limb recovery by improving gesture accuracy, muscle coordination, and engagement through gamified, emotion-driven adaptive algorithms, offering a practical path to **better rehabilitation outcomes** and **greater independence**. Future work will expand gesture recognition and optimise adaptive learning, **enabling automated clinical reports** and broader application in patient care.

5 References

3 Results

1. **Gesture Accuracy** – Higher recognition precision, especially for complex movements
2. **Muscle Coordination** – Improved control and flexibility with consistent training
3. **User Engagement** – Adaptive gamification reduced frustration and sustained motivation
4. **Positive User Experience** – Higher satisfaction with personalized, immersive rehabilitation

