Extended Reality (XR) vs. Virtual Reality (VR) for AI-Driven Balance Improvement in Older Adults

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Background & Problem

Falls are a leading cause of injury in older adults

Balance impairments increase hospitalization risk

Innovative technologies are needed to address mobility decline

Emerging Technologies

VR: Fully immersive, structured environments

XR: Real-world + virtual augmentation

AI enhances feedback, personalization, and real-time analysis

Objective of the Review

Compare	Compare AI-enhanced VR vs. XR for balance rehabilitation
Evaluate	Evaluate effectiveness, adaptability, and clinical utility
Assess	Assess equity and implementation barriers

Methodology Overview

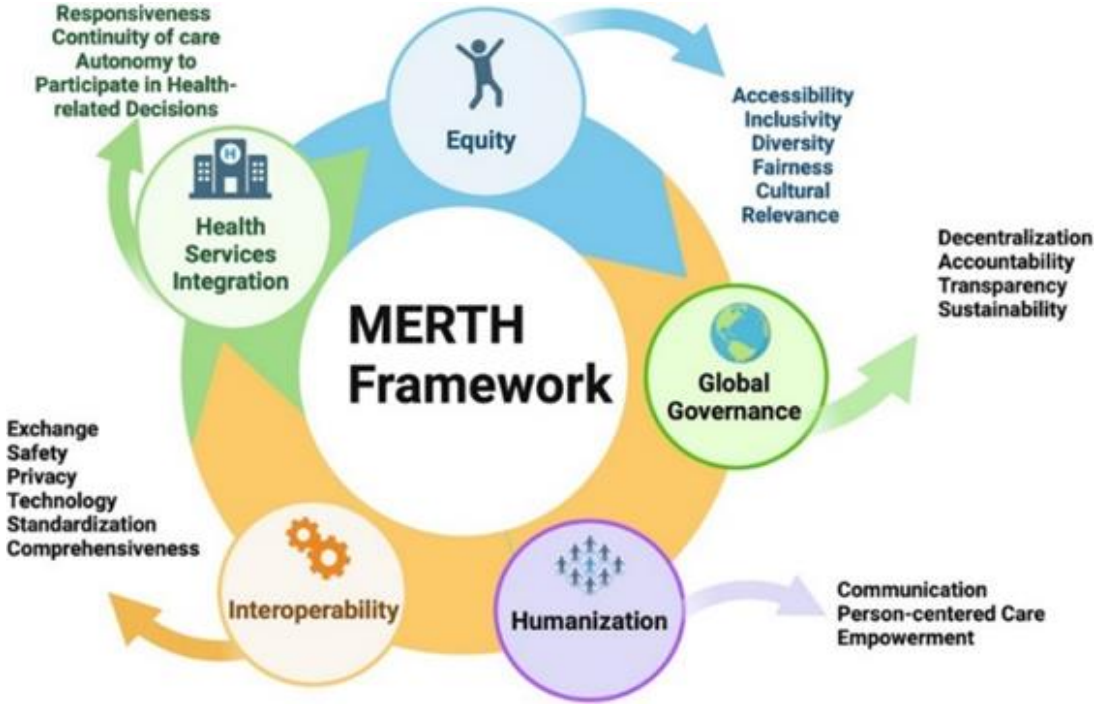
Rapid systematic review using PICO framework

Databases: PubMed, Scopus, IEEE Xplore

Inclusion: Peer-reviewed studies (last 5 years)

Evaluation Framework – MERTH

- Metaverse Equitable Rehabilitation Therapy Framework:
  - ➢ Equity
  - ➢ Health Services Integration
  - ➢ Technological Adaptation
  - ➢ Global Governance
  - ➢ Humanization



Data Extraction & Risk of Bias

- Dual-review process using Covidence

- Tools: AMSTAR-2, RoB 2, ROBINS-I

- Extracted: AI tools, rehab type, outcomes, demographics

Synthesis & Expected Outcomes

- Narrative synthesis guided by MERTH

- Evaluate clinical effectiveness, engagement, equity

- Compare VR and XR features and limitations

Challenges and Barriers

- Limited high-quality RCTs

- Variation in outcome metrics

- Barriers to adoption: cost, training, accessibility

Conclusion & Future Work

Clarify	- Clarify tech effectiveness for balance improvement
Inform	- Inform equitable, AI-driven rehab design
Guide	- Guide future research and clinical applications

Thank you!

Muchas Gracias!