

Advancements in geriatric assessment methodologies for physiotherapists

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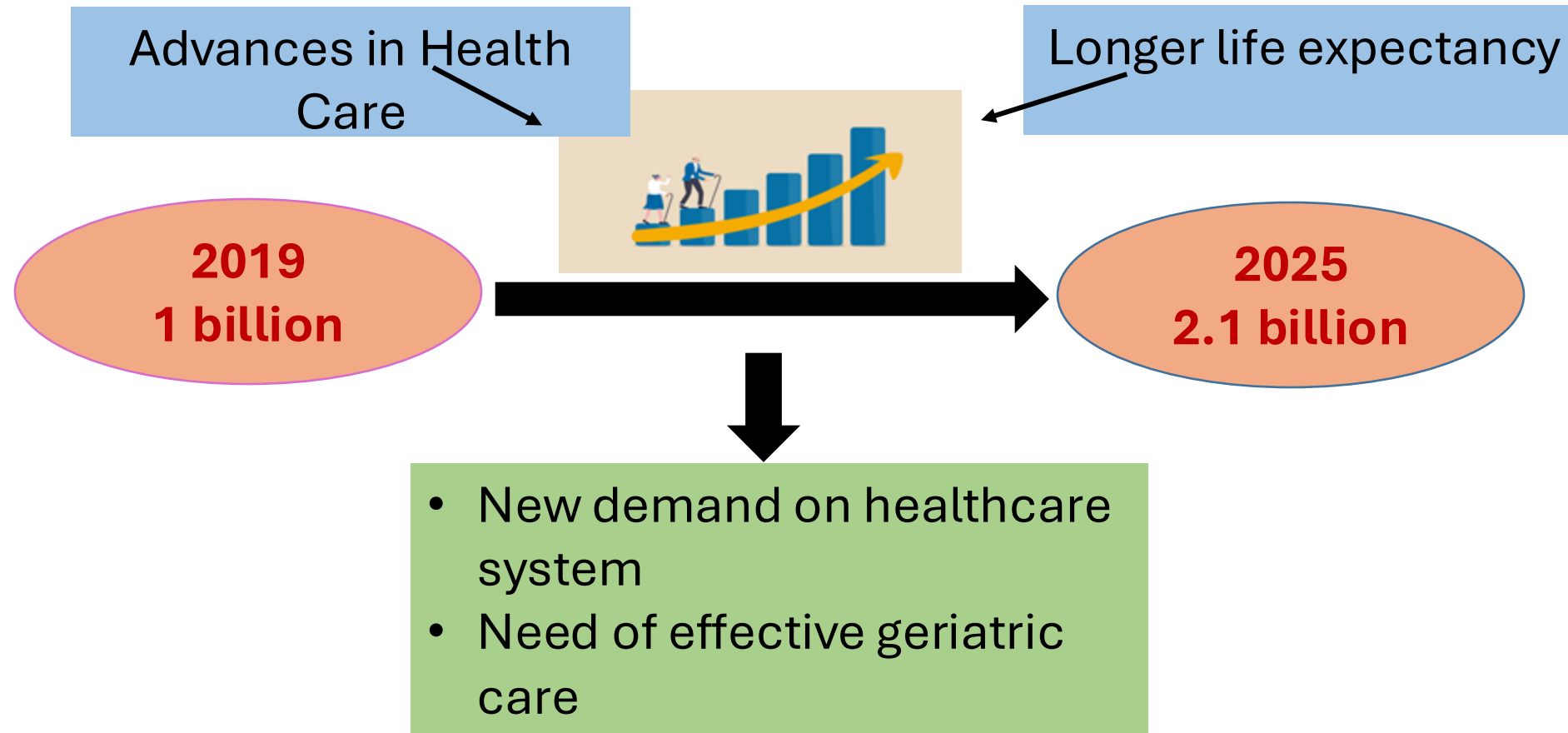
Consortium CAPAGE

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Learning Objectives

- Describe the advance emerging tools and techniques of geriatric assessment and rehabilitation
- Describe the new trends in geriatric related research
- Describe ethical implication of technology in geriatric care
- Describe the strategies for integrating advancement in to routine practice

Introduction



Peer discussion

- Peer discussion-Suggestions to identify the areas to be improved in geriatric assessment?
- Duration of peer discussion - 15 minutes
- Duration of presentation - 15 minutes

The challenges of geriatric assessment

- Requiring caregivers
- Limited service availability
- Administrative and cultural barriers
- Standards service quality
- High cost
- Extended waiting time



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Digital health in geriatric assessment and rehabilitation

Digital health is defined as,

“ Use of information and communication technology in support of health and related areas”



Image source: https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcSCF6fNfpD-22gAO2FUyCq_D9DnzhODw3A8NPqV_gQ1VEh8ArHD



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Digital health

- **Mobile apps**
- **Telemedicine**
- **Artificial intelligence**
- **Robotic rehabilitation**
- **Biomarkers**
- **Wearable Sensors**

Benefits of digital health in geriatric assessment

- Improve access to geriatric care
- Increase independence of older adults
- Early detection of health issues
- Personalized care plan
- Reduce healthcare cost and readmission

Telemedicine/rehabilitation and mobile apps

- Telerehabilitation is **“use of information and communication technologies (ICT) to provide rehabilitation services to people remotely in their home or other environments”**



- Therapeutic interventions
- Remote monitoring of progression
- Education
- Consultation
- Training

Image source: https://encrypted-tbn1.gstatic.com/images?q=tbn:ANd9GcSLUrB1Q5PxqcOyP_WesKJG8Uonk8iEy4Eg9OqMIShuaF0aPZWN

Group activity

- Identify different telemedicine/ telerehabilitation and mobile health applications
- Duration- 10 minutes



Video visit with a doctor, therapist or specialist



- Virtual access to board-certified doctors through digital platform
- Wide range of medical
- Can access through a variety of platforms

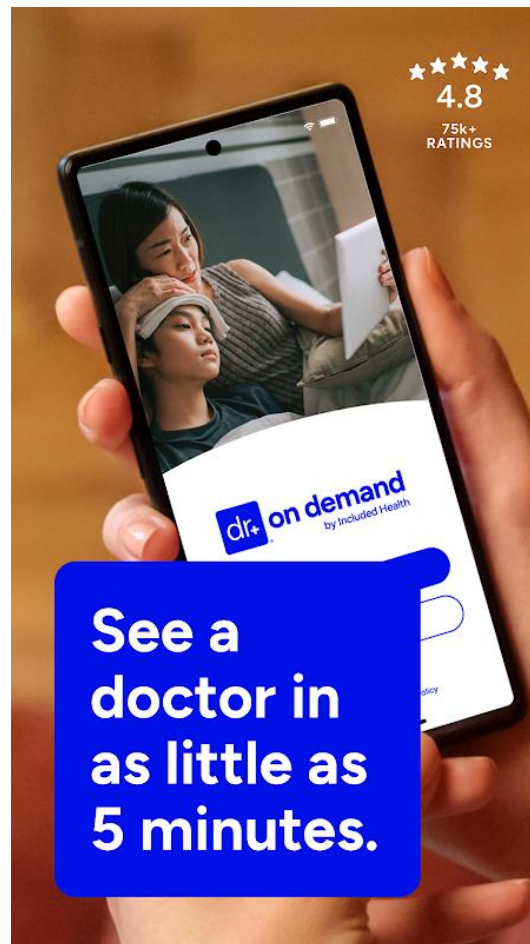
Teladoc



- Virtual care provide by only licensed or board-certified healthcare professionals
- Uses mobile apps, phone and video conferencing software, and other technologies
- Easy to access and convenient
- Medical services- general medicine, primary360, mental health, wellness care etc

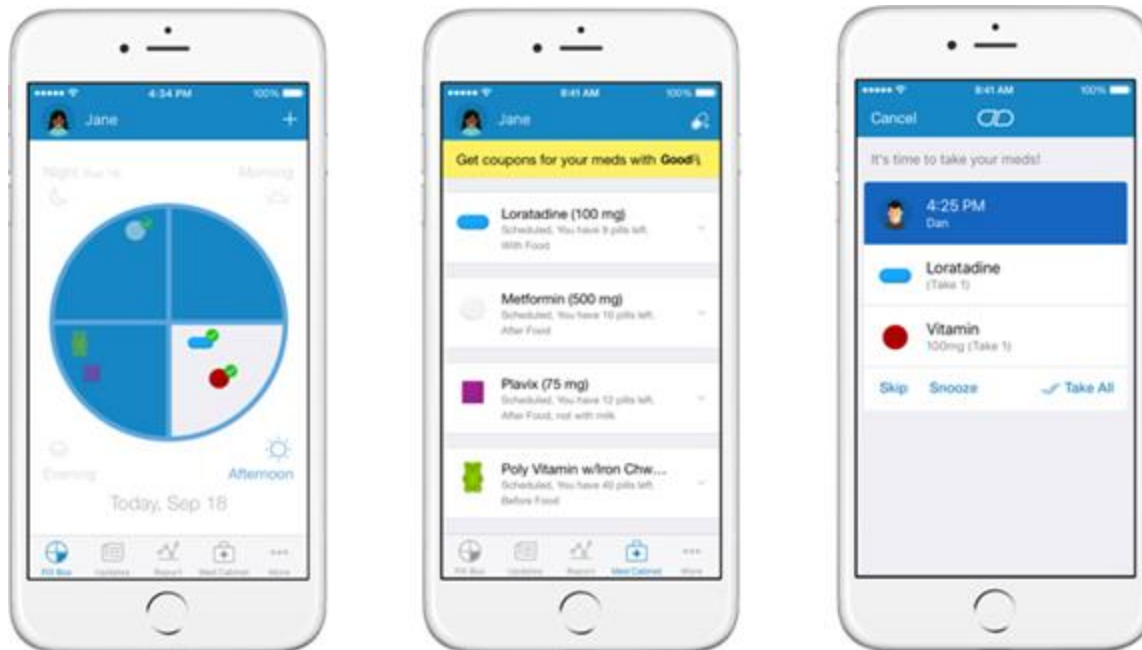
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Doctor on Demand



- Virtual healthcare- connect with certified, experienced medical and mental health care professionals.
- Access- via computer, smartphone or tablet app.
- Medical services-Online doctors appointments, online prescriptions, online medical certificates, mental health care plans, weight management

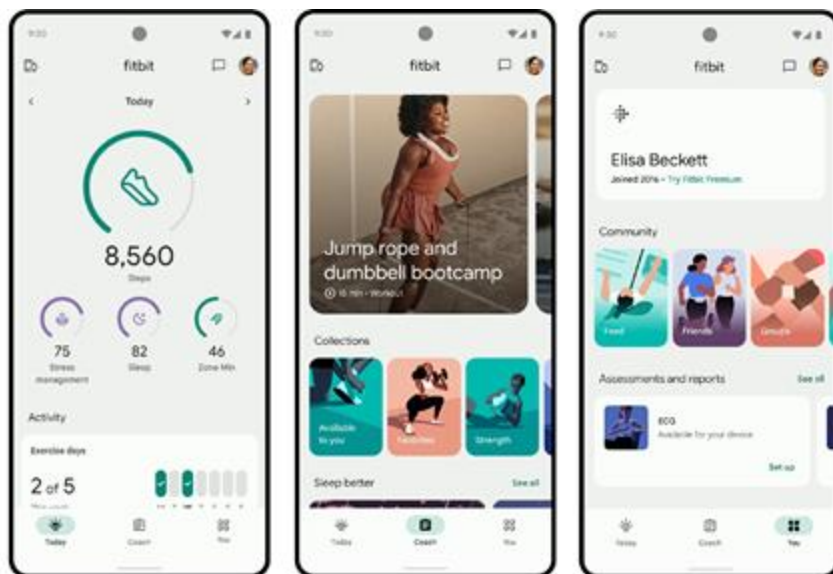
Medisafe



- Medication management app
- Customizable medication reminders with visual and audio alerts
- Provides drug information, possible drug interactions, refill and appointment reminders, and generates adherence reports

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Fitbit



- Activity tracking app
- Tracks users daily activities including steps taken, distance traveled, calories burned and sleep patterns
- Provides and process reports

Image source: https://encrypted-tbn2.gstatic.com/images?q=tbn:ANd9GcSc8q9CJ0wS_nFnkl9mxdRRjJ4IfiFajClkbDaPnC4QM4rdbg4m

Exer Health



Co-funded by
the European Union



- Measures range of motion and joint speed.
- It watches 24 points on the human body and can measure 100 different types of exercises and movements.

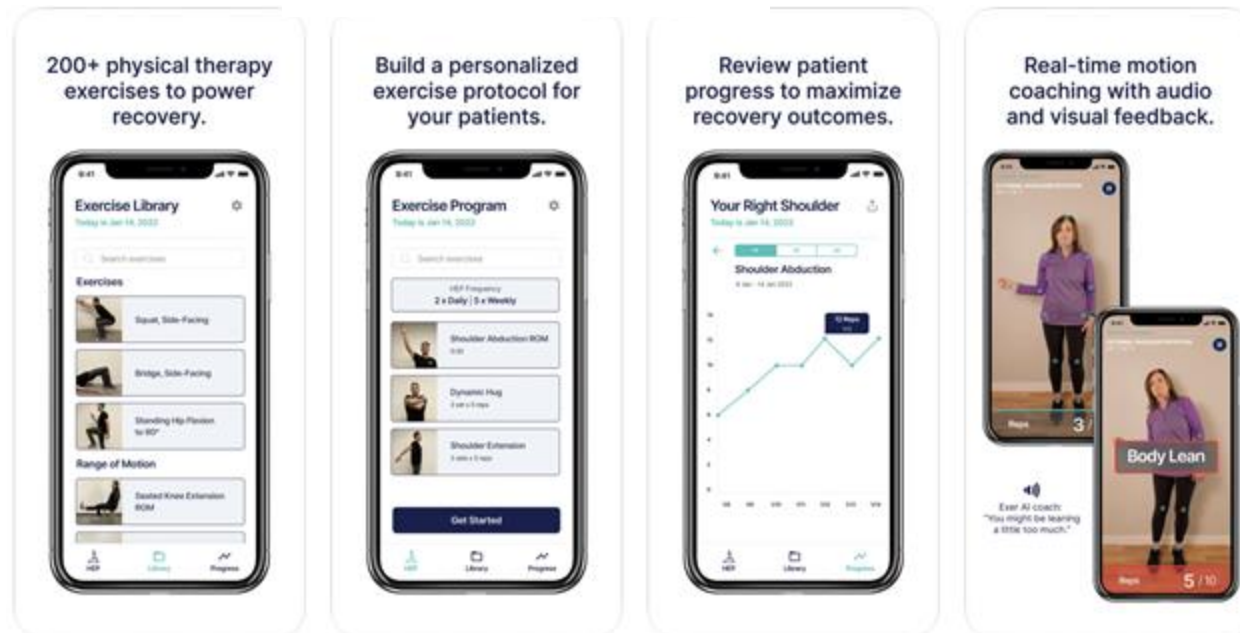


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Physio tricks



Co-funded by
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- Create customized home exercise programs
- Supporting adherence with easy-to-follow videos
- Pain tracking
- Progress monitoring

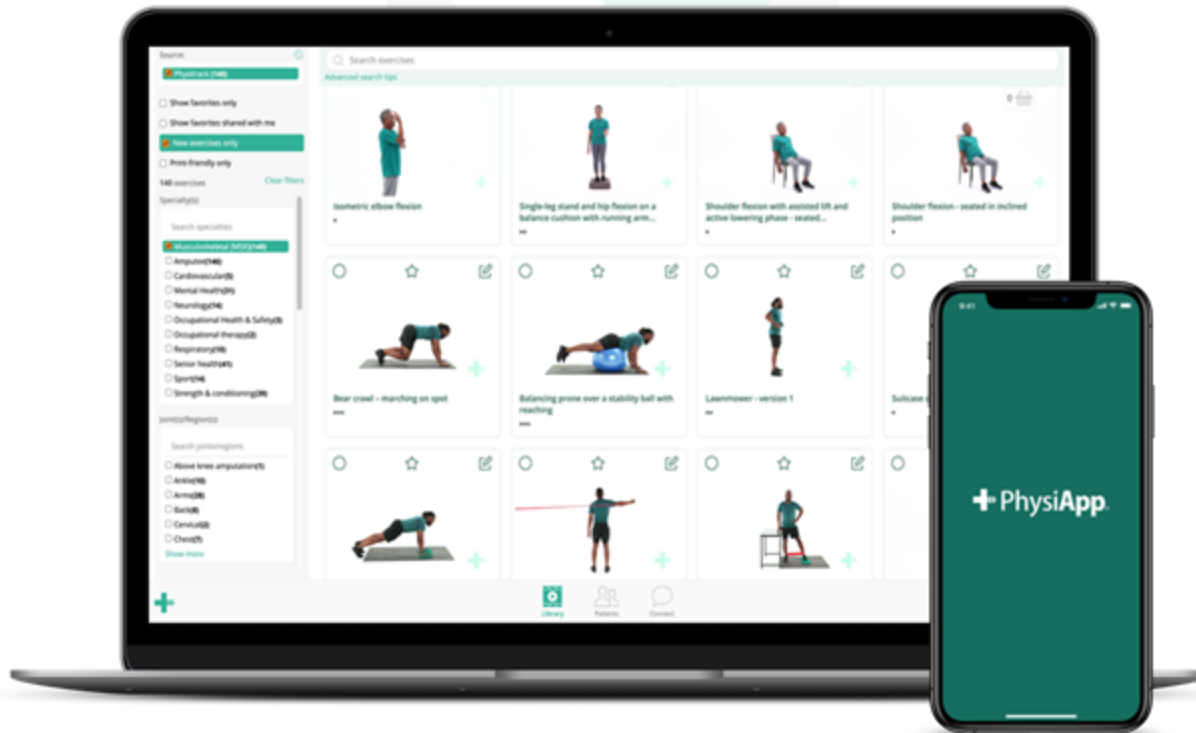


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- Enables physiotherapists to connect with their patients remotely
- Provide treatment program
- Monitor & guide patients
- Record the session on the platform
- The patient can submit recorded videos



Image source: https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcS_l5NRla2TnX733ZidS37DuMHEclyI5cH21xDDemORV9wjHzbj

Wearable devices



- Products designed to be worn on a user's body.
 - Smart watches
 - Smart shoes
 - Smart clothing
 - Smart glasses
 - AI hearing aids
 - Fitness trackers
 - Biosensors

Image source: <https://ars.els-cdn.com/content/image/1-s2.0-S0039914024001966-gr5.jpg>

Type of wearable devices	Function
Fitness trackers	Tracks user's physical activity and heart rate
Smart watches	Workout tracking, monitoring vital signs, sleep
Smart clothes	Measure heart rate, respiratory rate and sleep metrics
Glucose meters	Monitor blood glucose level
ECG/EKG monitors	Measure heart rate, rhythm, blood pressure Detect signs of arrhythmia: atrial fibrillations, bradycardia, tachycardia
Biosensors	Measures vital signs, body posture, physical activities, falls detection

Benefits and challenges of wearable devices

Benefits	Challenges
Continuous Monitoring	Securing patient data
Preventive Healthcare	Ensuring accuracy and reliability
Patient Empowerment	Improving accessibility and affordability
Data-Driven Decisions	Sensor calibration and maintainance of battery life
Remote Patient Monitoring	
Personalized Healthcare	

Biomarkers

Biomarkers are measurable indicators of a biological condition or process.

Prognostic biomarker-
*Predict the likely course
of a disease*

Predictive biomarkers-
*Determine how patient
will response to
treatments*

Diagnostic biomarkers-
*Identify presence of
disease*

**Pharmacological
biomarkers-**
*Show biological
response to a
treatment*

**Monitoring
biomarkers-**
*Track disease
progression or
response to therapy*

Pros Vs Cons of Biomarkers

Pros	Cons
Personalized medicine	High cost of development and validation
Early and accurate diagnosis	Variability across populations
Better disease monitoring	Ethical and regulatory considerations
Improve clinical trial outcomes	



Artificial intelligence

- Capability of a machine to perform a functional task overseen insightfully by humans
- AI in health care involves in **diagnostics, treatment planning, and patient management**

Artificial intelligence in physiotherapy

- AI driven diagnostic tools- analyze medical investigations and provide detail reports
- Create customized treatment plans
- Real time monitoring in treatment progression
- Wearable devices equipped with AI- real time monitoring of movement and posture
- AI powered virtual therapist
- Remote patient monitoring and assistance
- AI assisted robotic rehabilitation

Robotic devices

- Robotic devices provide innovative solutions to enhance recovery for individuals with various physical impairments.
 - Indications
 - Stroke
 - Multiple sclerosis
 - Spinal cord injury
 - Parkinson's disease
 - Older adults

Benefits of robotic devices

- Precision and accuracy
- Real time feedback
- Improve motor skills and mobility
- Increased independence
- Enhance quality of life
- Reduced therapist workload

Various Robotic devices

- Exoskeleton robots
- Soft robotics
- End-Effect Robots
- Electrical stimulation with Robotics
- Robotic rehabilitation with virtual reality

1. Exoskeleton robots

- Directly act upon specific joints of the individual
- There are two types of Exoskeleton Devices:
 - Active exoskeleton
 - Passive exoskeleton



Image source:
https://media.istockphoto.com/id/512276810/photo/woman-getting-physiotherapy-on-a-machine.jpg?s=612x612&w=0&k=20&c=UgsOfn9NqHBFLLWga_OTVPDN5yyKH5-XgalR9efkrBVI=

Image source:
<https://i.pinimg.com/736x/10/a7/e1/10a7e11116748ed7ed677aa2f2974f2d.jpg>

Active exoskeleton

- Powered by external energy sources
- Can be used for both rehabilitation and daily mobility assistance
- Eg-

Hybrid Assistive Limb (HAL)

ReWalk



Image source: <https://pbs.twimg.com/media/F2FD-o-XkAAihhr.jpg>

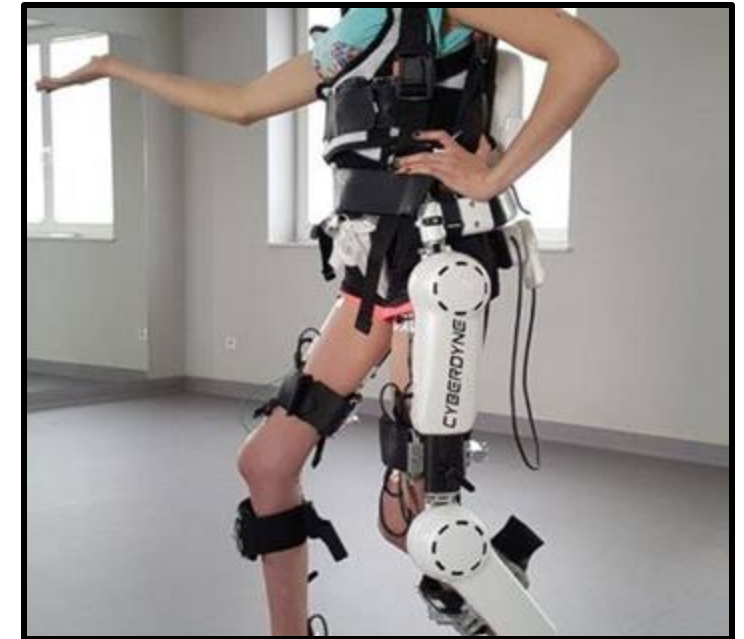


Image source: <https://constancecare.pl/templates/yootheme/cache/d1/hal-galeria-02-d1d3d9d1.jpeg>

Passive exoskeleton

- No external power source,
- Rely on mechanical structures and springs, to support and assist the user's movements.
- Eg-

Wilmington Robotic Exoskeleton (WREX)

NEUROExos



Image source: <https://encrypted-tbn3.gstatic.com/images?q=tbn:ANd9GcQIJqC1umortyx8nmZJ4AmHHHNuANUfc3BybENdpHgywB4TWINa>

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2. Soft robotics

- Robots made from highly flexible and compliant materials
- Used in minimally invasive surgery, rehabilitation, and assistive devices
- Eg-

Soft Robotic Glove

Soft Robotic Grippers

PDF source: <http://graphics.cs.cmu.edu/nsp/course/16899-s20/lectures/softProsthetics/Soft%20Prosthetics.pdf>



3. End-Effect Robots

- Attached only to the distal segments of the limbs
- Guiding the limb through specific movements and exercises
- Require less adjustment to individual patients
- Examples-

MIT-Manus

Lokomat

4. Electrical stimulation with Robotics

- Combined effect of robotics with electrical stimulations like;
 - Functional Electrical Stimulation (FES)
 - Electromyography-triggered neuromuscular electrical stimulation (RT-ENMES)
 - Electromyography (EMG)
 - Neuromuscular Electrical Stimulation (NMES)
- Improvements in motor skill and enhanced ability to perform everyday tasks more compared to robot-assisted training alone

5. Robotic rehabilitation with virtual reality

- Enables remote therapy sessions
- VR can provide a more effective rehabilitation process when combine with robotics.

Challenges and limitations of robotic devices

- High Initial Costs
- Skill Gap and Training
- Safety concerns
- Ethical and legal concerns

Uses of robotic rehabilitation devices

- Provide accurate assessment

Mobility training	Amadeo [®] , Pablo [®]
Muscle tone and spasticity	Amadeo [®]
Weight shifting, center of pressure (COP), body sway and load balancing over feet	Tymo [®]
Sensorimotor and cognitive function of the brain through behavioural tasks using the upper limb	KINARM [™]
Grip strength	Pablo [®]
Gait assessment	Pablo [®]

- Allows to custom-tailored therapies

Finger rehabilitation	Amadeo [®] , Pablo [®]
Mobility training	Amadeo [®] , Diego [®]
Balance training and postural control	Tymo [®]
ADL training	Pablo [®] , Tymo [®]
Gait training	Lexo [®] , Omega plus [®] , Lokomat [®]

Trends in research

- Recent advancements in geriatric physiotherapy related research include innovative approaches of assessment and rehabilitation.
- Eg-
 - Sensory based feedback system for gait rehabilitation
 - Digital therapeutic exercises using augmented reality glasses for frailty prevention among older adults
 - Three dimensional augmented reality system for balance and mobility rehabilitation in the elderly
 - A group-based real time videoconferencing telerehabilitation programme in recently discharged geriatric patients



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Group discussion

Identify recent trends in research related to innovations in geriatric physiotherapy assessment and rehabilitation

Duration of discussion - 15 minutes

Duration of presentation - 15 minutes

Ethical implication of technology in geriatric care

- Autonomy and beneficence
- Informed consent
- Resource allocation
- Privacy
- Equity and accessibility
- Depersonalization care
- Responsibility and accountability

Strategies for integrating advancement in to routine practice

- Ensure advance technologies are user-friendly and tailored to older adults
- Collect feedback from patients and healthcare professionals
- Evaluate impact on outcomes

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THANK YOU