

Digital Health Literacy

Overview



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Learning Outcomes

You are able to:

- identify the importance of DHL in current and future health care
- explain the obstacles that clients with limited DHL face
- describe characteristics of effective DHL in physiotherapy practice





Digital health technologies

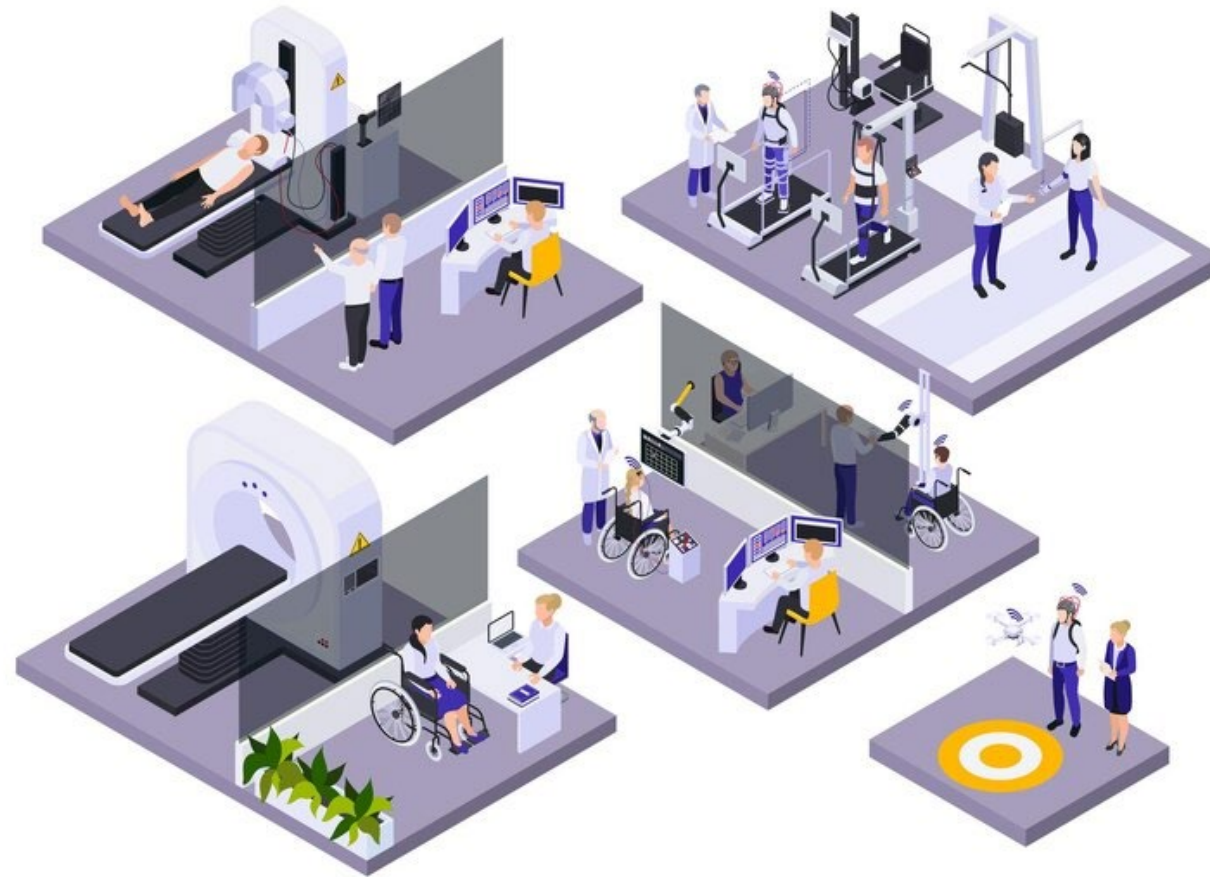
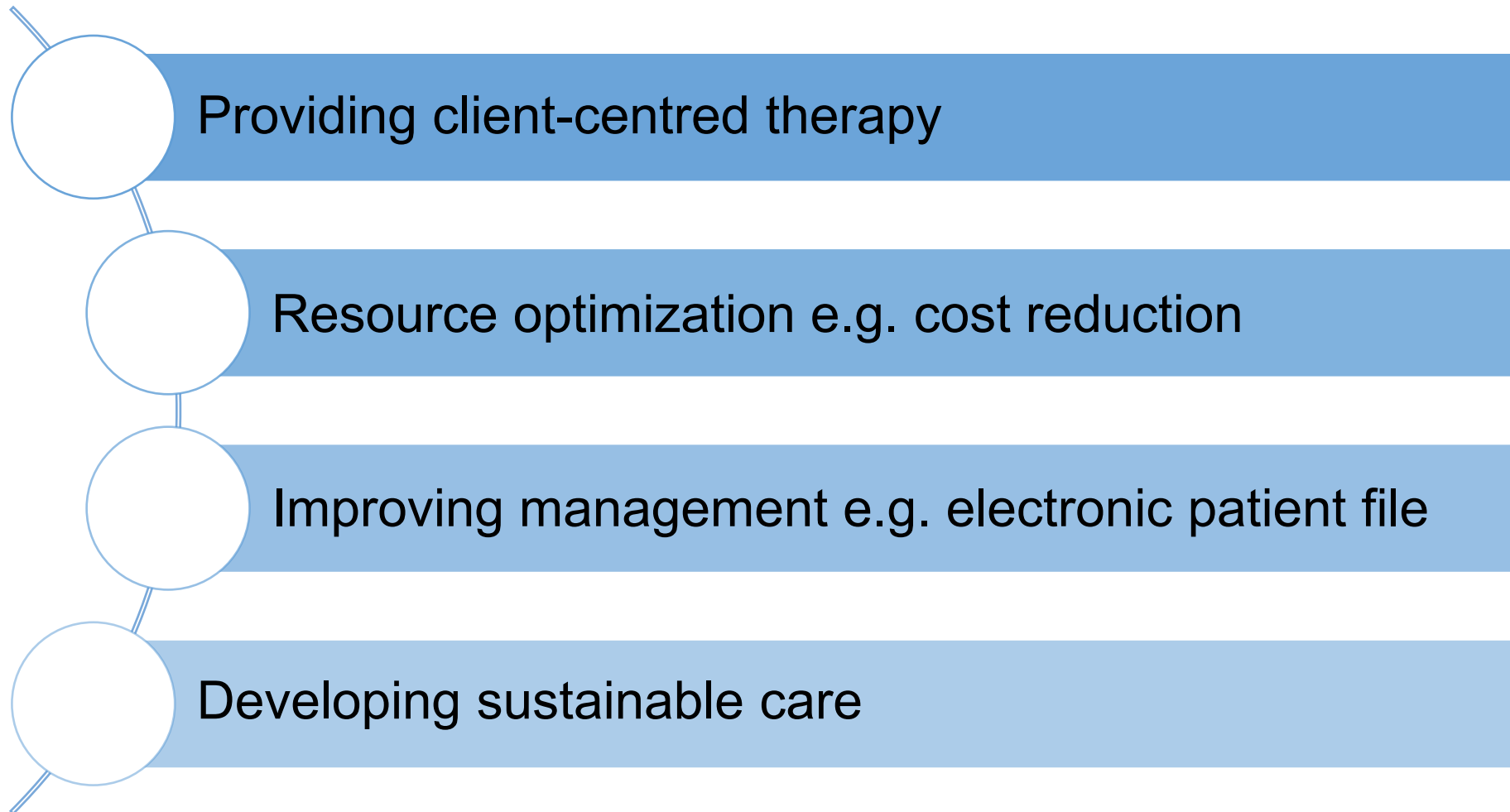


Image 1

Application in health care



Application in physiotherapy



Advantages of digital health technologies (1)

- Convenience of accessibility to available information, independent of time/place (Kloek et al., 2018)
- Enables client-centered care (Button et al., 2018; Hinman et al., 2017)
- Problem solving outside clinical settings
- Reduction of travel expense (Cottrell et al., 2020; Nelson et al., 2021; Pastora-Bernal et al., 2018; Tousignant et al., 2015)
- Improve communication between client and healthcare professional (Dunn & Hazzard, 2019)
- Cognitively and emotionally engagement for therapy (Lam et al., 2017)
- Possibility to monitor clients health status/behavior (Cai et al., 2017; O'Malley et al., 2014)

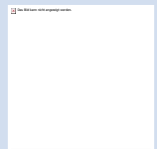
Advantages of digital health technologies (2)



Definition DHL (1)



*“Digital Health Literacy is the ability to seek, find, understand, or appraise health information from **electronic sources** and apply the knowledge gained to addressing or solving a health problem”* (Norman & Skinner 2006).



Additional knowledge and skills:

Definition DHL (2)

*“Digital Health Literacy is the ability, knowledge and motivation to use digital technologies in a **self-determined manner** in the areas of **health promotion, prevention and disease management**. This also includes to recognize and weigh up possible health risks through the use of digital offerings. Digital health literacy enables people to **find, understand, evaluate and use digital health information and applications** in order to make informed decisions” (SVR 2021).*

Factors influencing individual level of DHL (1)

Individual level of DHL is **predetermined and influenced** by several factors:

- **age** of the client (Neter & Brainin, 2012)
- **educational attainment** (Neter & Brainin, 2012)
- **socio-economic status** (Neter & Brainin, 2012)
- **willingness** to use digital technologies (Krebs & Duncan, 2015)

Factors influencing individual level of DHL (2)

Individuals with **limited DHL**:

- **have difficulties in accessing health care and insurance services** (Neter & Brainin, 2012)
- **suffer more often chronic diseases** (Neter & Brainin, 2012)
- **have a limited use of digital resources** (Neter & Brainin, 2012)



Image 2

Assessments for DHL (1)

Assessments for self report:

- **eHEALS** (Norman & Skinner 2006)
- **DHLI** (van der Vaart & Drossaert 2017)
- **eHLS** (Hsu et al. 2014)
- **eHLQ** (Kayser et al. 2018)
- **PRE-HIT** (Koopman et al. 2014)
- **E-HLS** (Seçkin et al. 2016)

Assessments for DHL (2)

- eHealth Literacy Scale (eHEALS) by Norman & Skinner (2006)
 - measure perceived skills at finding, evaluating, and applying electronic health information to health problems
 - 8 items on a 5-point Likert-scale for self-report, translated in 7 languages
- Review:
 - lack of correlation between eHEALS scores and actual task performance in online health information seeking (Quinn et al., 2017; van der Vaart & Drossaert, 2017)
 - could not sufficiently address critical and interactive health literacy skills (Norman, 2011; van der Vaart & Drossaert, 2017)

Assessments for DHL (3)

- eHealth Literacy Scale (eHEALS) by Norman & Skinner (2006)

| eHEALS | |
|---------------------|--|
| Item 1 ^a | I know what health resources are available on the Internet |
| Item 2 ^a | I know where to find helpful health resources on the Internet |
| Item 3 ^a | I know how to find helpful health resources on the Internet |
| Item 4 ^a | I know how to use the Internet to answer my questions about health |
| Item 5 ^a | I know how to use the health information I find on the Internet to help me |
| Item 6 ^a | I have the skills I need to evaluate the health resources I find on the Internet |
| Item 7 ^a | I can tell high quality health resources from low quality health resources on the Internet |
| Item 8 ^a | I feel confident in using information from the Internet to make health decisions |

Items from eHEALS by Norman & Skinner (2006)

Assessments for DHL (4)

- Digital Health Literacy Instrument (DHLI) by van der Vaart & Drossaert (2017)
 - to evaluate not only the **operational**, but also **navigational skills**, quality of information search, reliability assessment, relevance determination, adding self-generated content and privacy protection
 - 21 items for self report on a 4-point Likert-scale in English and translated in Dutch

When you search the Internet for information on health, how easy or difficult is it for you to...

4. Make a choice from all the information you find?
5. Use the proper words or search query to find the information you are looking for?
6. Find the exact information you are looking for?
7. Decide whether the information is reliable or not?
8. Decide whether the information is written with commercial interests (eg, by people trying to sell a product)?

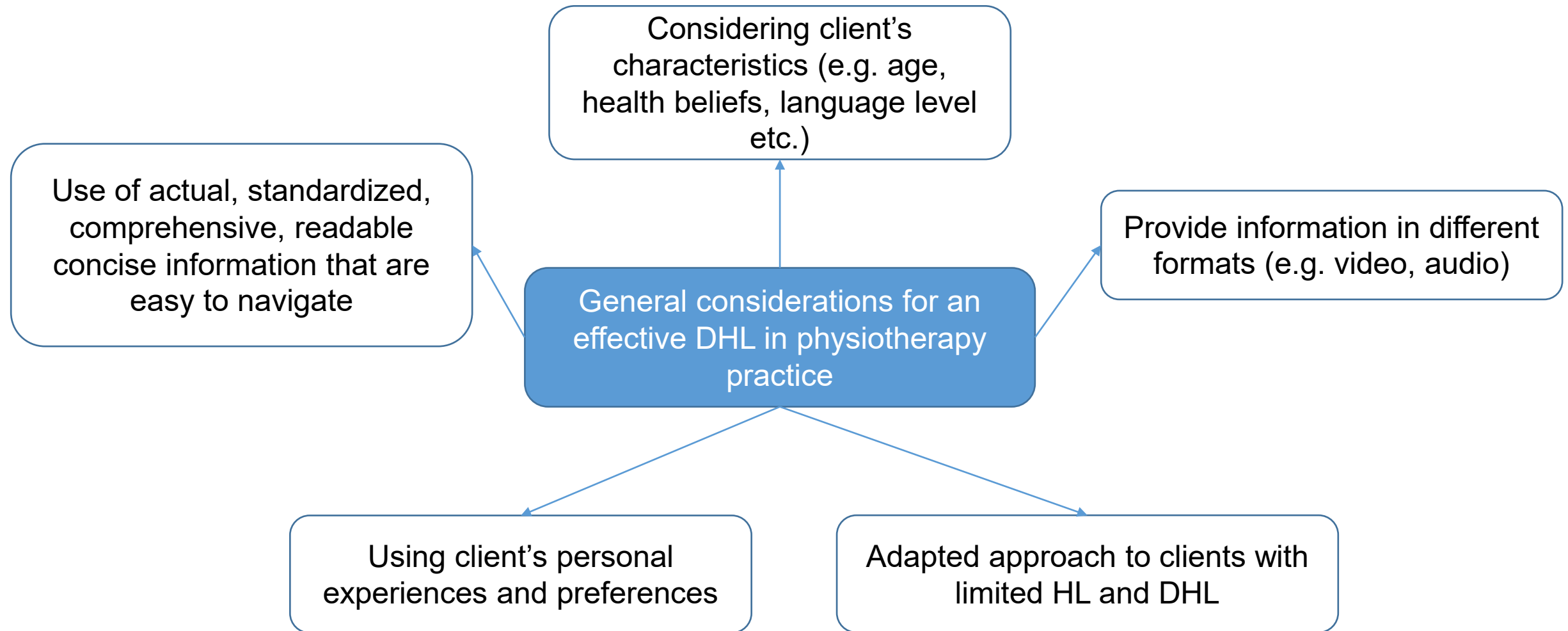
Excerpt of the DHLI, English version, questions 4 to 8, Vaart & Drossaert (2017)

Ethical challenges

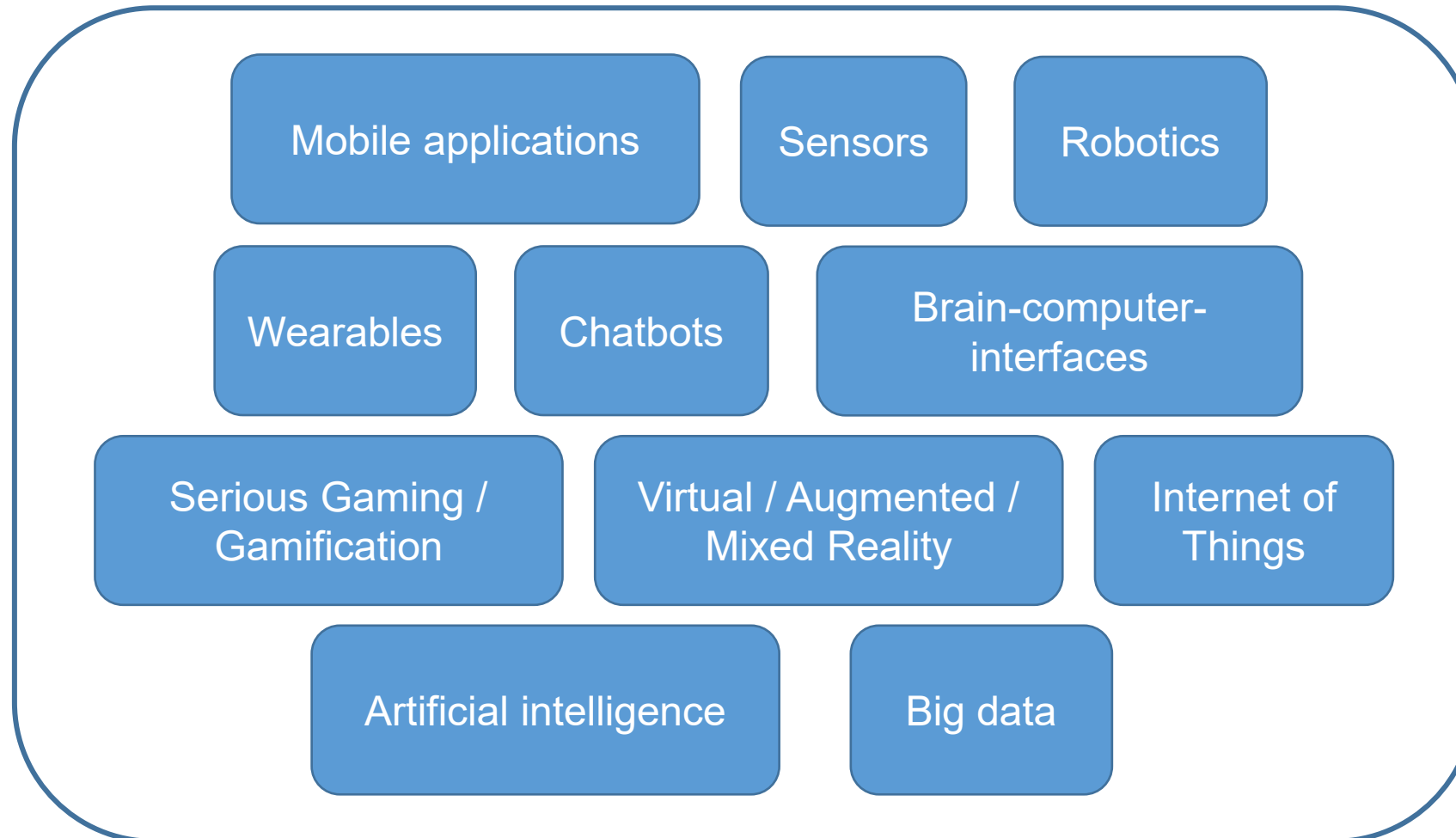
- **Promotion of social inequality** e.g. people who can't afford digital technologies, have language barriers etc., people with limited DHL (Kokkinakis, 2022)
- **Data collection and data sovereignty** must be maintained (Deutscher Ethikrat, 2018)



Image 3



Types of digital technologies



Examples for DHL in physiotherapy practice (1)

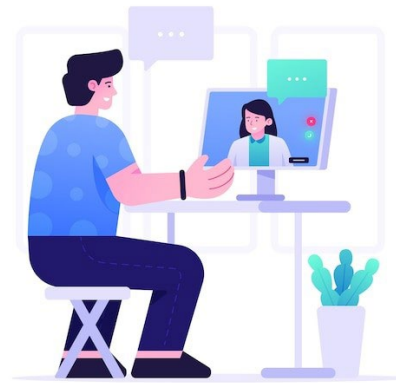


Image 4

Telerehabilitation

<https://www.youtube.com/watch?v=352QhUXDtWQ>



Image 5

Self-monitoring systems

https://www.youtube.com/watch?v=ARj_8_f4uiE

Examples for DHL in physiotherapy practice (2)



Image 6

Electronic prosthetic and other supportive devices
<https://www.youtube.com/watch?v=zeySwhjdgj8>

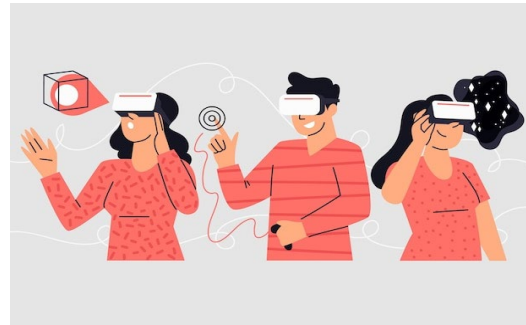


Image 7

Virtual/augmented reality
<https://www.youtube.com/watch?v=hocvsEMnWrA>

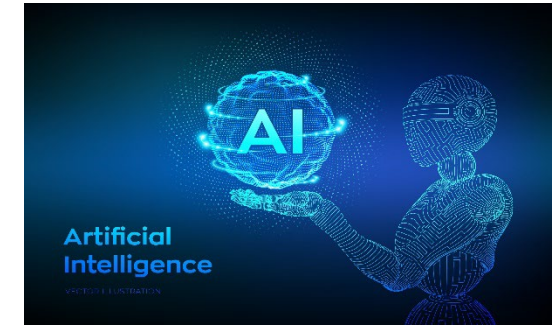


Image 8

Artificial intelligence
<https://www.youtube.com/watch?v=6HVMdkAkUfI>

References

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Image 6: Klinik für manuelle Therapie, 2021, Trailer zur Dokumentation HAL-System, <https://youtu.be/zeySwhjdqj8?t=138>

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Digital Health Literacy

Application of digital technologies in physiotherapy



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Learning Outcomes

You are able to:

- describe the different types of digital technologies that are used in physiotherapy
- give reasons for which therapy process (anamnesis, assessment, intervention, evaluation, monitoring) what digital technologies could be supportive
- give an example how to support a client in physiotherapy by digital technologies



Technologies in physiotherapy– programs/software

- Mobile applications
- Virtual/augmented reality
- Artificial intelligence
- Chatbots

Technologies in physiotherapy – devices/hardwares

- Smartphones, tablets, laptops/computers
- Sensors
- Wearables
- Head-mounted displays
- Robotics
- Brain-computer-interfaces

Technologies in physiotherapy – Mobile applications



Image 1

Description

Mobile applications are all programs that can be accessed through an application (**App**), usable via devices such as tablets, smartphones, computers and laptops.

Technologies in physiotherapy – Mobile applications

Therapy-Apps

Technologies in physiotherapy – Mobile applications

Examples:

- Remote physiotherapy, providing a therapy plan adopting to the clients progress/condition due to clients self-monitoring through the App.
- Possible in combination with face-to-face physiotherapy or as a standalone therapy that is remotely guided/supervised by a physiotherapist.

Ascenti, 2020, The Ascenti Physio App, <https://www.youtube.com/watch?v=BheYOYnqFps>

- A tool for an assessment or evaluation, through videoconferencing and a software.
- The aim is to quantify the range of motion of a joint.

MedBridge, 2021, Measuring Range of Motion Remotely - Jared Vagy | MedBridge <https://www.youtube.com/watch?v=nyiCwC-fLeU>

Technologies in physiotherapy – Virtual reality (VR)

Description:

- Involving **real-time stimulation** and interactions through multiple sensorial channels/feedback (visual and auditory, sometimes haptic, even smell and taste if possible), based on **a synthetic environment in which the subject feels his presence** (Burdea & Coiffet, 2003).

Application in physiotherapy:

- Providing physical exercise/information, promotion of activity, engagement of therapy, balance, coordination, relaxing, postural stability, gait

Technologies in physiotherapy – Virtual reality (VR)

Examples:

- Usable as an adjunct on face-to-face therapy to promote physical activity and engage/motivate the client in the therapy process.
- In this example VR is used to engage movement during walking in a client after stroke.

Cleveland Clinic, 2014, Virtual Reality Rehab for Parkinsons, <https://www.youtube.com/watch?v=hocvsEMnWrA>

- Also feasible as remote therapy to activate muscles and reduce pain symptoms of paretic limbs in clients after stroke or brain injury.
- In this example VR is used for mirror therapy of the unaffected arm/hand.

Rewellio, 2018, Virtual Reality (VR) and rewellio's innovative stroke therapy software, <https://www.youtube.com/watch?v=y3tWWIVG0zA>

Technologies in physiotherapy– Augmented reality (AR)

Description:

- **Enhanced version of the real physical world** that is achieved through the use of digital visual elements, sound or other sensory stimuli (Hayes, 2020).

Application in physiotherapy:

- Education, measurement of movement, providing physical exercise and information, promotion of activity, engagement of therapy, balance, coordination, postural stability, gait,

Technologies in physiotherapy– Augmented reality (AR)

Examples:

- AR used for educational purposes to experience anatomy in vivo through a head-mounted-display.
- The display creates an avatar of a anatomical body. The users are able to see the avatar, to move through it and take out different pieces of the body.

Case Western Reserve University, 2016, Transforming Medical Education with Microsoft HoloLens, <https://www.youtube.com/watch?v=h4M6BTYRIKQ>

- Remote physiotherapy as a whole therapy concept for individual aims through a system that includes sensors, microphones, speakers and projectors.

Jimmy Simmons, 2017, Spark: An Augmented Reality Physical Therapy Concept, https://www.youtube.com/watch?v=6-sZgzt_hU8

Technologies in physiotherapy–Artificial intelligence(AI)

Description:

- Systems that display intelligent behavior by **analyzing their environment and taking actions** – with some degree of autonomy – to achieve specific goals (EU commission, 2018).
- Data can be gathered through **information of softwares** (e.g. mobile applications) or through **hardwares** (e.g. wearables)

Application in physiotherapy:

- Analysing data, collected by the client → provide the optimal personalized physiotherapy

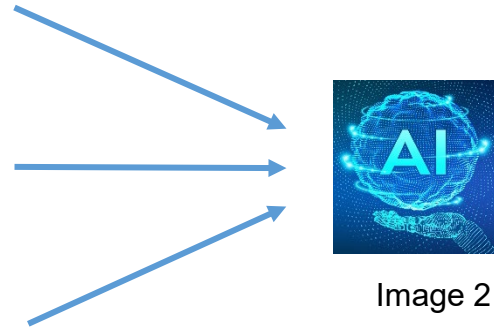
Technologies in physiotherapy–Artificial intelligence(AI)

Information from:

Smartphones, tablets,
laptops/computers

Sensors

Wearables



Feedback in real time

Therapy systems adapting to clients condition

Evaluating/analyzing clients feedback/data

Lindera, 2021, Real Time Exercise Feedback by Lindera SDK: That's how easy it's!,
<https://www.youtube.com/watch?v=6HVMdkAkUfl>

Technologies in physiotherapy – Chatbots

Description:

- Application that uses **artificial intelligence to converse** with humans in natural language. Users can ask questions, to which the system responds in natural language. It can **support text input, audio input or both**.

Application in physiotherapy:

- Clarifying questions in an interactive way, facilitate organizing the therapy process

Technologies in physiotherapy – devices/hardwares

- Smartphones, tablets, laptops/computers
- Sensors
- Wearables
- Head-mounted displays
- Robotics
- Brain-computer-interfaces

Technologies in physiotherapy – Sensors

Description:

- Technical devices that provide data about the user. The sensors can measure **quantitative data of human movement and vital signs.**

Application in physiotherapy:

- Assessment/diagnostic, evaluation, motion tracking, measurement of movement, monitoring, provide sensory feedback during movement, promotion of self-management

Technologies in physiotherapy – Sensors

Example:

- Offering a remote physiotherapy through sensors in combination with an App to generate real time feedback.
- The aim is to engage clients movement, track the activity to perform exercises accurately.

SWORD health, 2021, Sword Health | A better way to treat MSK pain, <https://www.youtube.com/watch?v=8KEIaDuMHqc>

- Shoe based sensors for an accurate measurements of gait, especially for dynamic foot pressure mapping.

EMIRATES SPORTSMED, 2019, Latest in Wireless In-Shoe Sensor Technology, https://www.youtube.com/watch?v=sOjj5ZA3H_M

Technologies in physiotherapy – Wearables

Description:

- Wearables are technical devices that are worn as normal clothes or accessories, and provide data about the client **via sensors**. These sensors can measure quantitative data of human movement and vital signs (Porciuncula et al., 2018).

Application in physiotherapy:

- Assessment/diagnostic, provide sensory feedback during movement, measurement of movement, motion tracking, monitoring, analyzing data, providing exercises, promotion self-management

Technologies in physiotherapy – Wearables

Example:

- In this example sensors from a smart ring measure quantitative data of movement and vital signs and send these data to an App where the data are analyzed.
- The aim is to self-monitor the health status in order to adapt the personal trainings-/therapy-plan/activities tailored to the individuals needs.

New Tech Gadgets, 2021, 5 BEST SMART RINGS in 2021 - check out No 1, <https://www.youtube.com/watch?v=ORDFR1Y8bZ4>

Technologies in physiotherapy– Robotics

Description:

- **Robotics used in rehabilitation** are machines comprising sensors and actuators that can be programmed to substitute, help or encourage sequences of human actions (Krebs & Volpe, 2013).

Application in physiotherapy:

- Support of the movement/facilitation of the movement, providing sensory feedback during movement, measurement of movement, motion tracking

Technologies in physiotherapy– Robotics

Example:

- An exoskeleton is used as an adjunct for physiotherapy for a client with a neurological disorder with the aim to support walking.
- The client is not able to walk independently without that device.
- The aim of this therapy in the long term is to improve the functional movement in the daily life without wearing that device.

Klinik für Manuelle Therapie Hamm, 2021, Trailer zur Dokumentation HAL-System, <https://www.youtube.com/watch?v=zeySwhjdgi8>

Technologies in physiotherapy – Brain-computer-interfaces

Description:

- Enables communication between the brain and a connected device or computer (Choi, 2018) without activation of the peripheral nervous system.
- Connection is established via the peripheral or the central nervous system (brain and spinal cord nerves) (Adewole, 2016).

Aims for applicaiton in therapy:

- Performing/supporting movement, providing sensory feedback during movement, improvement of brain activity

Technologies in physiotherapy – Brain-computer-interfaces (BCI)

Examples:

- The aim is to perform movement of paretic limbs in clients with stroke.

EPFL, 2013, Brain-Computer interface used for rehabilitation after a stroke, <https://www.youtube.com/watch?v=9rYPS8unLpE>

- A remote use of a brain-computer-interface is also possible with a head-mounted-display via EEG-electrodes and machine learning algorithms to activate brain regions.
- The goal could be an improvement in concentration e.g. in clients with ADHS.

DW Shift, 2021, Brain-Computer Interface: With These Devices You Can Control Machines with Your Mind | BCI explained, <https://youtu.be/6QcY7v9Kio4?t=58>

References

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Image 2: Adapted; [Free vector wireframe robot. ai artificial intelligence in robotic hand. machine learning and cyber mind domination concept](#) by [iuriimotov](#), free license by [freepik](#)

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