MiNT01

Computer-based Speech and Language Therapy for Dysarthria Rehabilitation – A Pilot Study

Presenting Author: Andre Hallack

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Communication challenges like dysarthria significantly impact stroke and TBI survivors. While UK guidelines recommend 45 min/day of rehabilitation [1], actual speech and language therapy averages under 10 min/day [2], emphasizing the need for scalable solutions. Computer-based therapy enables frequent, intensive practice with minimal SLT involvement, which has shown promise in managing communication impairments [3].
Beautiful Voice (BV) is an online platform offering personalised exercises and assessments with real-time feedback on speech intelligibility, rate, pitch, and loudness. SLTs can also assign and monitor exercises remotely. This study by the University of Manchester evaluated its effect on dysarthria rehab over 2 months.
Methods
11 participants with dysarthria (9 stroke, 2 TBI
mean age 58, onset 3 years) completed the study. Targeted homework exercises were assigned by a SLT and performed by participants using BV. Outcomes were measured using the Frenchay Dysarthria Assessment (FDA) and Communication Outcome After Stroke (COAST) at baseline and post-trial. Engagement and qualitative feedback were also assessed.
Results
Significant improvements were observed in all domains ($p<0.05$):
• FDA scores increased by 8% (140 → 151)
o Intelligibility Subset: 15%
o Mechanism Subsets: 7%
• COAST scores improved by 7% (74 → 79)
Greater improvements in intelligibility suggest that users applied communication strategies like modulating speech.
Participants varied in use frequency and duration. Personalised exercises, visual feedback, e-mail reminders and gamification were reported as motivating factors. They also had varied perceptions of speech improvement, often relying on feedback from trusted others for validation.
Discussion
The study shows that BV can contribute to dysarthria rehabilitation, showing both functional and impairment-based measurable gains. Further research with larger, more diverse samples is needed to confirm these findings and explore long-term impacts.
Reference 1
[1] National Institute for Health and Care Excellence. (2013). Stroke rehabilitation in adults Clinical guideline [CG162] https://www.nice.org.uk/guidance/cg162
Reference 2

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[3] Mitchell, C., Bowen, A., Tyson, S., & Conroy, P. (2017). A feasibility randomized controlled trial of ReaDySpeech for people with Dysarthria after stroke. Clinical Rehabilitation, 32(8), 1037–1046. https://doi.org/10.1177/0269215517748453

MiNT04

The Role of Clinical Input in Health Technology Assessments of Neurological Rehabilitation Medical Devices

Presenting Author: Barry Richards

Co-author(s):

Introduction/Rationale:
Neurological rehabilitation technologies, such as medical devices and digital solutions, are advancing rapidly. However, their integration into clinical practice depends on Health Technology Assessments (HTAs) that evaluate efficacy and cost-effectiveness. Clinical input in HTAs for neurological rehabilitation devices remains limited, which may lead to misaligned technology development and suboptimal patient outcomes. This study explores the importance of including clinical expertise in HTA processes.
Aim(s) of the Study/Project:
This study aims to:
1. Evaluate the role of clinical input in HTAs of neurological rehabilitation technologies.
2. Identify barriers clinicians face in contributing to HTA processes.
3. Assess the impact of clinical involvement on technology adoption and patient care.
Methods:
We conducted a systematic review of HTA research on medical devices published in the last five years, focusing on the extent of clinical input at various HTA stages. Interviews were conducted with clinicians and manufacturers regarding their experiences with HTAs. Case studies were also examined where clinical input influenced technology adoption and utilization, particularly through the MiNT consultancy and education ecosystem.
Main Results and Conclusions:
Preliminary findings show that while clinical input is recognized in HTAs, it is often limited to clinical outcomes, with minimal involvement in early HTA stages. Clinicians report challenges such as lack of time, training, and opportunities for input. Devices with more clinical input during HTA stages are more likely to be successfully integrated into practice and show better patient outcomes.
Contribution to New Knowledge:
This study underscores the need for systematic inclusion of clinical perspectives in HTAs to improve technology relevance and effectiveness in clinical settings.
Implications for Practice and Policy:
Early clinical involvement in HTAs is essential to enhance technology design, adoption, and patient outcomes.
Service-User Engagement:
While service-user perspectives were indirectly captured through clinician feedback, future research should directly incorporate patient input to further optimize technology design.
Reference 1
Smith, V., Warty, R., Nair, A. et al. Defining the clinician's role in early health

technology assessment during medical device innovation – a systematic review. BMC Health Serv Res 19, 514 (2019). https://doi.org/10.1186/s12913-019-4305-9
Reference 2
Ming J, He Y, Yang Y, Hu M, Zhao X, Liu J, Xie Y, Wei Y, Chen Y. Health technology assessment of medical devices: current landscape, challenges, and a way forward. Cost Eff Resour Alloc. 2022 Oct 5;20(1):54. doi: 10.1186/s12962-022-00389-6. PMID: 36199144
PMCID: PMC9533595.

MiNT05

Implementing Personalised Robotic-Assisted Gait Training to Improve Outcomes in Multiple Sclerosis - A Case Study

Presenting Author: Rob Bateman

Co-author(s):

Robotic-Assisted Gait Training (RAGT) has been shown to be significantly effective in patients with Multiple Sclerosis (PwMS) in improving gait speed, gait endurance and balance (Bowman et al., 2021). Moreover, RAGT is more advantageous when administered to the patients with a greater degree of disability (Calabro et al., 2021). However, its effect on fatigue and spasticity has been under-researched alongside the optimal progression and adjustment of parameters (van Dellen and Labruyère, 2022). A single case design was used to examine pre and 9 weeks post personalised Lokomat gait training. A 44-year-old female PwMS with an Expanded Disability Status Scale (EDSS) of 6.0 participated in 3 sessions per week of progressive Lokomat® gait training for 9 weeks. Lokomat training target parameters were
45 minutes duration, body weight support 30%, speed initially 1.0km/h with goal to achieve 1.6 km/h (week 0-3), 1.9km (week 3-6) and 2.2 km/h (week 6-9). Guidance force (GF) was prioritised and progressively reduced from 100% to between 30 and 50% to enable intervals (3-5 minutes, 3-4 reps) of assist-as-needed support (path control). Recovery period between intervals was set at 80% GF, 30% BW for a duration of 3-5 minutes. There was a clinically meaningful improvement in gait speed using the 10-metre walk test baseline (0.2 m/s) 3 week (0.37 m/s), 6-week (0.39 m/s) and 9-week (0.52 m/s). Walking endurance on the 6-minute walking test (baseline 100m vs. 9-week 168m both with wheeled walker) and The Modified Fatigue Impact Scale (MFIS
15point reduction) both exceeded the minimal important change. Spasticity reflected by the Leg Activity Measure (LegA) section B demonstrated 9-point reduction in activities difficulty. Implementing personalised RAGT with the Lokomat® led to clinically meaningful improvements across gait, spasticity and fatigue in this single case study. Further research utilising this personalised framework to optimise parameter settings in RAGT is required.

Reference 1
Bowman, T., Gervasoni, E., Amico, A. P., Antenucci, R., Benanti, P., Boldrini, P., Bonaiuti, D., Burini, A., Castelli, E., Draicchio, F., Falabella, V., Galeri, S., Gimigliano, F., Grigioni, M., Mazzon, S., Mazzoleni, S., Mestanza Mattos, F. G., Molteni, F., Morone, G., Petrarca, M., ... "CICERONE" Italian Consensus Group for Robotic Rehabilitation (2021). What is the impact of robotic rehabilitation on balance and gait outcomes in people with multiple sclerosis? A systematic review of randomized control trials. European journal of physical and rehabilitation medicine, 57(2), 246–253.
Reference 2
Calabrò, R. S., Cassio, A., Mazzoli, D., Andrenelli, E., Bizzarini, E., Campanini, I., Carmignano, S. M., Cerulli, S., Chisari, C., Colombo, V., Dalise, S., Fundarò, C., Gazzotti, V., Mazzoleni, D., Mazzucchelli, M., Melegari, C., Merlo, A., Stampacchia,

G., Boldrini, P., Mazzoleni, S., … Italian Consensus Conference on Robotics in Neurorehabilitation (CICERONE) (2021). What does evidence tell us about the use of gait robotic devices in patients with multiple sclerosis? A comprehensive systematic review on functional outcomes and clinical recommendations. European journal of physical and rehabilitation medicine, 57(5), 841–849.
Reference 3
van Dellen, F., & Labruyère, R. (2022). Settings matter: a scoping review on parameters in robot-assisted gait therapy identifies the importance of reporting standards. Journal of neuroengineering and rehabilitation, 19(1), 40.

MiNT06

A Novel Hands-on-Tech Circuit Based Therapy for Inpatient Upper Limb Rehabilitation following Acquired Brain Injury: A Healthcare Improvement Project

Presenting Author: Rob Bateman

Co-author(s): Nunez, Eva

There is a growing role for technology in delivering intensive upper limb therapy (Daly et al, 2019). Auditing our service revealed upper limb rehabilitation was primarily delivered in a single 45-minute sessions 5 times per week. Time on task (TOT) at best was 17 minutes in 1:1 Occupational Therapy (OT) and at least 3 minutes during a Physiotherapy (PT) session. The aim of this service improvement initiative was to enhance opportunity for patients to engage in arm rehabilitation following acquired brain injury. The feasibility of a novel semi-supervised (2:3 paradigm) 90-minute (time scheduled) 5 times a week, circuit-based "Hands-on-Tech" upper limb group for adult inpatients following stroke was established in a cohort of 5 patients. In this 3-week pilot feasibility project we demonstrated 95% attendance in our cohort alongside 41 minutes mean TOT. This represented a 240% increase in active time compared to at best usual upper limb 1:1 OT care. A 2:3 paradigm of semi-supervised practice was consistently achieved. 3 minor adverse events occurred related to fatigue. To examine efficacy in this initial cohort of patients and a subsequent group of 5 patients our primary outcome measure was the Fugl Meyer Upper Extremity (FM-UE) and Arm activity measure (ArmA). A total of 10 adult patients following acquired brain injury completed the 3-week group with a mean initial FM-UE score of 22. Pre-to-3-week FM-UE gains were 9 points indicating a clinically meaningful difference (Page et al., 2012). Pre-to-3-week ArmA section A and B demonstrated a clinical meaningful reduction of 4.6 points and 8 points respectively (Ashford et al., 2014). Post-hoc analysis in 3 chronic stroke patients (mean 7.6 months post stroke) revealed Pre-to-3-week FM-UE gains of 5 points. A novel "Hands-on-Tech" circuit-based training appears feasible for patients following acquired brain injury. Further evaluation continues in a larger cohort of patients and within different levels of chronicity.

Reference 1
Daly, J. J., McCabe, J. P., Holcomb, J., Monkiewicz, M., Gansen, J., & Pundik, S. (2019). Long-Dose Intensive Therapy Is Necessary for Strong, Clinically Significant, Upper Limb Functional Gains and Retained Gains in Severe/Moderate Chronic Stroke. Neurorehabilitation and neural repair, 33(7), 523–537.
Reference 2
Page, S. J., Fulk, G. D., & Boyne, P. (2012). Clinically important differences for the upper-extremity Fugl-Meyer Scale in people with minimal to moderate impairment due to chronic stroke. Physical therapy, 92(6), 791–798
Reference 3
Ashford S, Slade M, Nair A, Turner-Stokes L (2014) Arm Activity measure (ArmA) application for recording functional gain following focal spasticity treatment. International Journal of Therapy and Rehabilitation 21(1): 10-17

MiNT07

Maximizing Patient Engagement in Rehabilitation Through Accessible Voice-Assistant Technology

Presenting Author: Amber Walter

Co-author(s): Drake, Elisabeth

Background: Patient engagement, especially as it relates to engagement in their care, is a fundamental topic in consideration of health outcomes for people living with paralysis. Broader considerations of patient engagement and experience have coalesced with technological development, bringing many new healthcare assistive technologies to the market. Debra Ruh noted "Technology can promote improvements in efficiency, reliability, and speed, and can reach across boundaries of class, gender, and geography to deliver the benefits to all." Aims: Integrate accessible technology within an advanced rehabilitation setting to demonstrate a comprehensive approach toward improving patient outcomes. Demonstrate patient independence and engagement that facilitates improved outcomes in a rehabilitation program. Methods: Integration of voice assistant technology capable of information, entertainment, TV controls, and maximizing self-care and advocacy on a 30-bed unit serving persons with spinal cord injury Results: Patients immediately utilized the device most frequently for TV controls. Additional teaching of patients was required to learn ways to integrate technology in ways that could improve compliance with self-care tasks. Conclusions: Voice assistant technology complements an advanced rehabilitation technology environment, allowing for accessible options for technology use when leaving a facility. A focus on patient-centered technologies in addition to those that maximize care therapists can provide represents increased value toward persons who will live with physical disabilities. Contribution to new knowledge: Few reports exist on how this technology may benefit people in an inpatient rehabilitation hospital setting and effect on care and outcomes. Implications for practice: Rehabilitation professionals should also consider devices that would be easily transferred to community settings in the care of people with spinal cord injury.
Reference 1
Singh, G., Nimmon, L., Sawatzky, B., & Ben Mortenson, W. (2022). Barriers and Facilitators to eHealth Technology Use Among Community-Dwelling Individuals With Spinal Cord Injury: A Qualitative Study. Topics in spinal cord injury rehabilitation, 28(2), 196–204. https://doi.org/10.46292/sci21-00016

MiNT08

Early Feasibility study of using immersive gamified functional electrical stimulation for upper limb neurorehabilitation

Presenting Author: Ivan Isakov

Co-author(s): Atefipour, Kourosh

Stroke survivors with severe upper limb weakness are a large but underserved population in neurorehabilitation [1].
In this paper, we are using v-health: a novel upper limb neurorehabilitation system combining functional electrical stimulation (FES), extended reality (XR) and gamification. The system's unique approach includes:
- Combination of FES, movement tracking and extended reality (XR) in real time
- Gamified FES exercises
- Tracking and analysis of the movement
- Designed for one hand operation, even for people with reduced mobility.

While FES has already been shown to improve the upper limb impairment [2], it's mostly passive or requires a therapist to perform functional task training. Our technology combines FES and XR for an automatic triggering of FES when a patient performs a functional task, situated in a gamified and engaging environment.
Previously [3], we have run a study on 26 healthy individuals comparing their physiological and mood responses to virtual reality fitness training with and without synchronised electrical muscle stimulation. Those findings highlighted the potential of FES-enhanced virtual exercise for improved physical exercise and adherence to training.
Here, we have tested the system 29 therapists and 14 patients with neurological conditions (stroke and spinal cord injury). Our system was shown to be easy to use, immersive and engaging. In addition, it was shown to better target patients with wrist weakness, especially with MRC scale < 4, who don't have any other methods of improving their impairment.
This technology has a potential for improving the upper limb impairment of neurological patients.

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Serrada I, McDonnell MN, Hillier SL. What is current practice for upper limb rehabilitation in the acute hospital setting following stroke? A systematic review. NeuroRehabilitation. 2016 Jul 15;39(3):431-8. doi: 10.3233/NRE-161374. PMID: 27589513.
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Khan MA, Fares H, Ghayvat H, Brunner IC, Puthusserypady S, Razavi B, Lansberg M, Poon A and Meador KJ (2023) A systematic review on functional electrical stimulation based rehabilitation systems for upper limb post-stroke recovery. Front. Neurol. 14:1272992
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Hoolahan, K., Isakov, I., & Chan, K. C. (2024). An Investigation into the Effects of Virtual Reality and Electrical Muscle Stimulation on Mood, Exertion and Muscular Fatigue. International Journal of Virtual Reality, 24(1), 46-78.

MiNT10

Use of the ORCITI device in the gait of people with multiple sclerosis

Presenting Author: Sergio Rodríguez Menéndez

Co-author(s): García Santos, Claudia
Cancio-Donlebun Blanco, Héctor.

ORCITI is a portable, monitored, DAFO-type ankle device. It provides exomuscular support and active assistance to ankle movement, supplementing muscle strength for those whose motor function is impaired.
The aim of the present study was to analyze gait and balance ability with the ORCITI device in comparison with a classic buddy ranch and without any type of orthosis in people with multiple sclerosis.
A prospective cross-sectional observational descriptive study was performed. Inclusion criteria were established as being diagnosed with MS in any of its states, being of legal age and not having suffered a flare in the last 12 months. In addition, participants had to be users of some type of antiequine and present gait difficulties in the swing phase. Before starting the evaluation, data were taken from medical reports (EDSS, type of MS...) as well as sociodemographic variables. Subsequently, the following tests were administered (with OCTICI, with buddy ranch and without orthosis): Gait Assessment and intervention TOOL, timed 25-foot walk and time up and go. In addition, they were administered the psychosocial impact of assistive devices tool (PIADS).
Results: significant improvements are observed with the use of OCTICI in people, with improvements in gait and balance, as well as in walking speed. It also shows improvements in relation to psychosocial impact.
Conclusions: the ORCITI device, still in the testing phase, is intended to be a gait facilitator for people with MS. The results of the present study place this device as a useful tool in the rehabilitation of people with MS.
Reference 1
Psychosocial impact of mobility assistive technology on people with neurological conditions.

MiNT11

Robotic Technology for Retraining Functions After Stroke: a Questionnaire Study from a Singapore Perspective

Presenting Author: Ananda Sidarta

Co-author(s): Wong, Russell A
Tan, Isaac O
Kuah, Christopher Wee Keong
Lim, Yu Chin

Rehabilitation robotics has gained significant attention in stroke clinical studies worldwide. A wide variety of rehabilitation robots targeting upper and lower extremities are now available on the market. However, many hospitals and outpatient rehabilitation centers still rely on conventional therapy. This is particularly true in Singapore, despite its reputation for economic advancement, high-quality healthcare services, and adoption of value-added technology. Notably, most rehabilitation robots are primarily designed for motor training, with limited focus on sensory impairments such as proprioception and tactile deficits. In this study, we surveyed 132 allied health practitioners, specifically occupational therapists (OTs) and physiotherapists (PTs), using a structured questionnaire. The study focused on the use of robotic technology to conduct objective assessments and deliver high-dose interventions for stroke survivors. We also explored their views on the feasibility of using robots for sensory therapy. Other healthcare professionals, such as physiatrists, doctors, nurses, and speech therapists, were excluded from the study.

Our findings revealed that the adoption of robotic technology as part of regular clinical care remains relatively limited. Only one-third of therapists (31.8%) reported more than three years of experience with such technology, mainly in inpatient settings (64.3%) and with patients in the subacute and chronic stroke phases (35.7%). More than half of therapists (52.3%) had fewer than three years of experience, while 16% had no experience at all. Although the use of technology for assessment was minimal, most therapists (87.1%) reported incorporating it into stroke interventions. The adoption of such technology for intervention was found to be particularly high for lower-limb (gait and balance) training in the clinic. More than 75% of respondents agreed that proprioception is a crucial component of stroke rehabilitation and that combining robotic technology with conventional therapy enhances rehabilitation outcomes, particularly for retraining proprioception.

However, significant barriers to adopting robotic technology were identified, including high costs, usability challenges, and space constraints. These barriers are especially relevant given Singapore's compact land area and developed economy, underscoring the need for innovative approaches to integrate technology into rehabilitation practices. While therapists expressed positive attitudes toward technology-based rehabilitation, overcoming these obstacles is essential to improving accessibility and widespread adoption of robotic technology in stroke rehabilitation.

To address these challenges, industry partners should work closely with

healthcare stakeholders to focus on developing more compact technologies, conducting clearer cost-benefit analyses, and offering flexible business models for healthcare providers.

MiNT12

A Global and Collaborative Ecosystem for Neurotechnology Integration: A Multi-Stakeholder initiative for Clinicians, Researchers and Manufacturers.

Presenting Author: Laura Marriott

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Wilks, Matt,

Neurotechnology has the potential to transform patient care, but its complexity can overwhelm clinicians who struggle to keep up with rapid advancements and access quality education. This gap, combined with poor adoption of technology in clinical rehabilitation, impairs patient outcomes. Evidence shows that higher dose repetition and intensity lead to better results, yet implementation remains lacking. To tackle these challenges, we propose a collaborative initiative uniting clinicians, researchers, and neurotechnology manufacturers to develop a collaborative ecosystem for integrating neurotechnology into clinical practice, maximizing both healthcare and commercial benefits.

The aim of this project is to establish a comprehensive framework that promotes collaboration among clinicians, researchers, and industry professionals, overcoming barriers to the widespread adoption of neurotechnology in rehabilitation. By creating an ecosystem with a strong focus on clinical education, we aim to enhance clinicians' understanding of neurotechnology applications and contribute to the development of real-world solutions that address the needs of patients, healthcare professionals, and device manufacturers.

The project will design a comprehensive ecosystem, including a clinical education pathway focused on neurotechnology application that aligns with patient-centred goals, as defined by the ICF. We will show how researchers can leverage real-world data collected through this ecosystem to track outcomes and inform future research directions, facilitating improved device adoption and utilization. The ecosystem will use the outline of an existing ecosystem currently operating in the UK, illustrating real-world solutions that meet the needs of all stakeholders.

By fostering collaboration among clinicians, researchers, and manufacturers, this ecosystem will accelerate neurotechnology adoption, enhance patient outcomes, and spur innovation in the field. Users will gain valuable insights into building effective partnerships that optimize neurotechnology use in global healthcare, and support the creation of global clinical guidelines in the use of neurotechnology.

Reference 1
Ming J, He Y, Yang Y, Hu M, Zhao X, Liu J, Xie Y, Wei Y, Chen Y. Health technology assessment of medical devices: current landscape, challenges, and a way forward. Cost Eff Resour Alloc. 2022 Oct 5;20(1):54. doi: 10.1186/s12962-022-00389-6. PMID: 36199144
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Reference 2

Smith, V., Warty, R., Nair, A. et al. Defining the clinician's role in early health technology assessment during medical device innovation – a systematic review. BMC Health Serv Res 19, 514 (2019). https://doi.org/10.1186/s12913-019-4305-9

MiNT14

Investigating fatigue in persons with multiple sclerosis using the APP-Fatigue Diary

Presenting Author: Jelka Jansa

Co-author(s): Jansa, Jelka
Horvat Ledinek, Alenka
Brecl , Gregor Jakob

Background
Fatigue is one of the most important clinical problems in the management of persons with multiple sclerosis (PwMS) (1). PwMS are thus often referred to Occupational therapy (OT) for providing Self-management strategies (2). The App Fatigue-Diary was developed to assist a PwMS and an occupational therapist to investigate fatigue occurrence in daily life.
Methods
The App-Fatigue diary was developed in 2022 allowing PwMS' to record his/her perception of experiencing fatigue in daily life over 5 weeks. It is simple and enabling entering data about how, when and where fatigue interferes with the performance of self-care, productivity and leisure activities (3). Data are saved locally, providing immediate visual feedback but can also be shared digitally. PwMS scores own perception of fatigue occurrence on scale from 1-5. Score 1 refers to no fatigue, score 5 refers to experiencing extreme fatigue and the scale has additional intermediate scoring.
Consecutive PwMS, including into OT for group or individual fatigue – management counselling, were invited to monitor their fatigue level over 5 weeks and submit it digitally. The study was approved by Medical Ethics Committee.
Results
There were 21 PwMS who anonymously, digitally submitted their data. They were 7 male and 14 female, average age of 45 years±5, average disease duration of 10 years±5,2, average EDSS of 3±2,0 and of all MS-disease types. The average education year was 14± 3. Further, 19 PwMS were working, 1 was retired and 1 unemployed. The median fatigue occurrence over morning was 2,9 (range 2,1 – 3,6), afternoon was 4,4 (range 2,2 – 4,6) and evening was 4,5 (range 2,7- 4,8). PwMS experienced various symptoms, warning of fatigue occurrence, yet most common were: drowsiness, heavy legs, numbness in legs and hand, spasms, clumsiness and "light headiness".
Conclusion
In our sample self-investigation of fatigue over longer period was useful in terms of exploring individual fatigue profile. Although there was an individual profile, the sample indicated the increase of experiencing fatigue over the day and the variety of symptoms being experienced individually.
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Reference 2
2) Alizadeh, N., Packer, T., Chen, Y. T., & Alnasery, Y. (2023). What we know about fatigue self-management programs for people living with chronic conditions: A scoping review. Patient education and counseling, 114, 107866. https://doi.org/10.1016/j.pec.2023.107866
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3) Law, M., Baptiste, S., McColl, M., Opzoomer, A., Polatajko, H., & Pollock, N. (1990). The Canadian occupational performance measure: an outcome measure for occupational therapy. Canadian journal of occupational therapy. Revue canadienne d'ergotherapie, 57(2), 82–87. https://doi.org/10.1177/000841749005700207