

Deep Phenotyping Post-Stroke Recovery: A Holistic Approach for Occupational Therapy

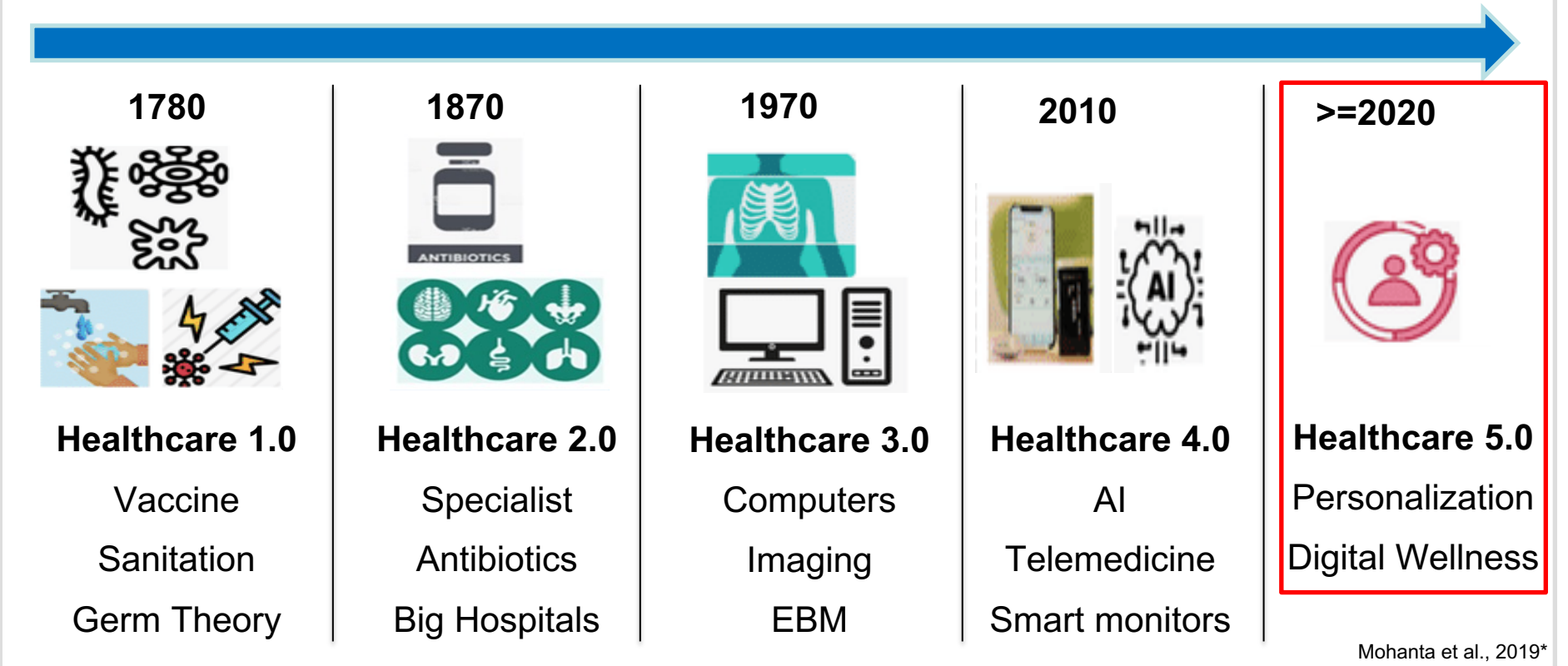
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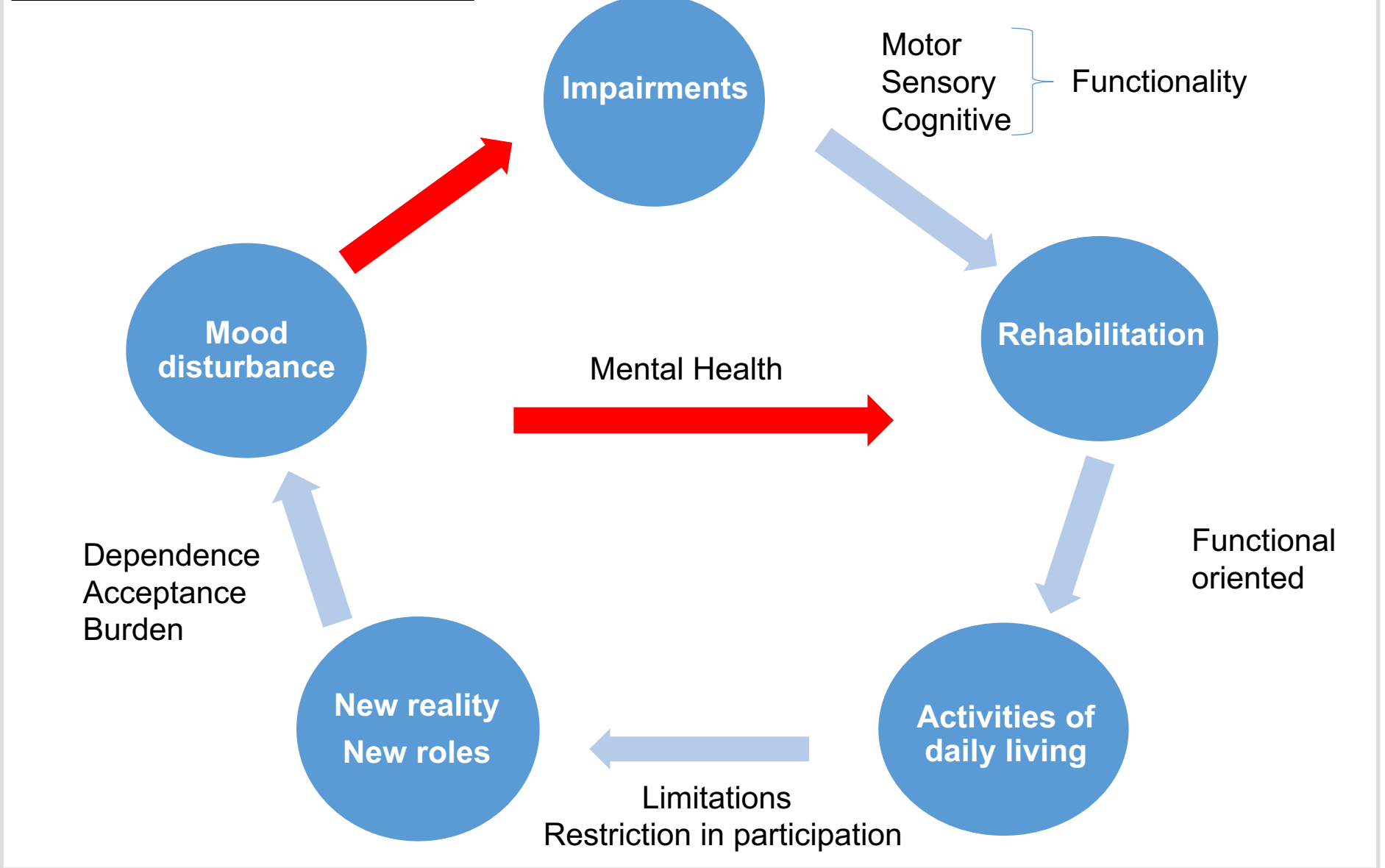
BACKGROUND

Healthcare Transformation



*Mohanta, Bhagyashree, Priti Das, and Srikanta Patnaik. "Healthcare 5.0: A paradigm shift in digital healthcare system using artificial intelligence, IOT and 5G communication." 2019 International conference on applied machine learning (ICAML). IEEE, 2019.

Post-stroke Vicious Circle



Deep Phenotyping

- Detailed characterization of the individual aspects of a patient's condition
- Personalizing rehab strategies based on a patient's specific recovery needs

Domains	Examples
Motor Impairment	Strength, tone, motor control, dexterity
Sensory Integrity	Touch, proprioception, vibration
Cognitive Status	Cognitive functions
Functional and Perceptual Abilities	ADLs and perceptual abilities
Psychosocial Factors	Psychiatric symptoms, social support
Behavioral and Lifestyle Factors	Occupational balance, lifestyle habits, activity levels
Rehabilitation Response	Therapeutic response for individualized rehabilitation

Phenotyping for Upper-Limb Recovery in Stroke Rehabilitation

METHODS

Assessments and Timeline

Description	Tool	WEEK		MONTHS				
		1-2	Discharge	3	6	12	24	36
Global disability level	mRS				X	X	X	
UL motor impairments	FMA-UE, SAFE, Grip strength	X	X	X	X	X	X	X
UL activity capacity	ARAT	X	X	X	X	X	X	X
UL sensory impairments	NSA	X	X	X	X	X	X	X
UL spasticity	MAS	X	X	X	X	X	X	X
UL pain	VAS	X	X	X	X	X	X	X
UL use	UPSET	X	X	X	X	X	X	X
Neglect	BELLS	X	X	X	X	X	X	X
Trunk impairment	TIS	X	X	X	X	X	X	X
Functional independence	FIM	X	X			X		
Cognitive impairment	MoCA			X	X	X	X	X
Quality of life	EQ-5D, SSQOL			X	X	X	X	X
Neurophysiology	MEP	X						
Technology-assisted	Prototypes	X	X	X	X	X	X	X
Psychosocial factors: Depression, anxiety, fatigue, insomnia, occupational balance, social support	BDI, GAD, MFIS, ISI, LBI, MOSSS				X	X	X	
Qualitative interviews	Lived experiences				X	X	X	
Activity levels	Fitbit				Continuously for 6 months			

Cheng, Hsiao-Ju, et al. "Upper limb sensorimotor recovery in Asian stroke survivors: a study protocol for the development and implementation of a Technology-Assisted digital biOmaRker (TAILOR) platform." *Frontiers in Neurology* 14 (2023): 1246888.

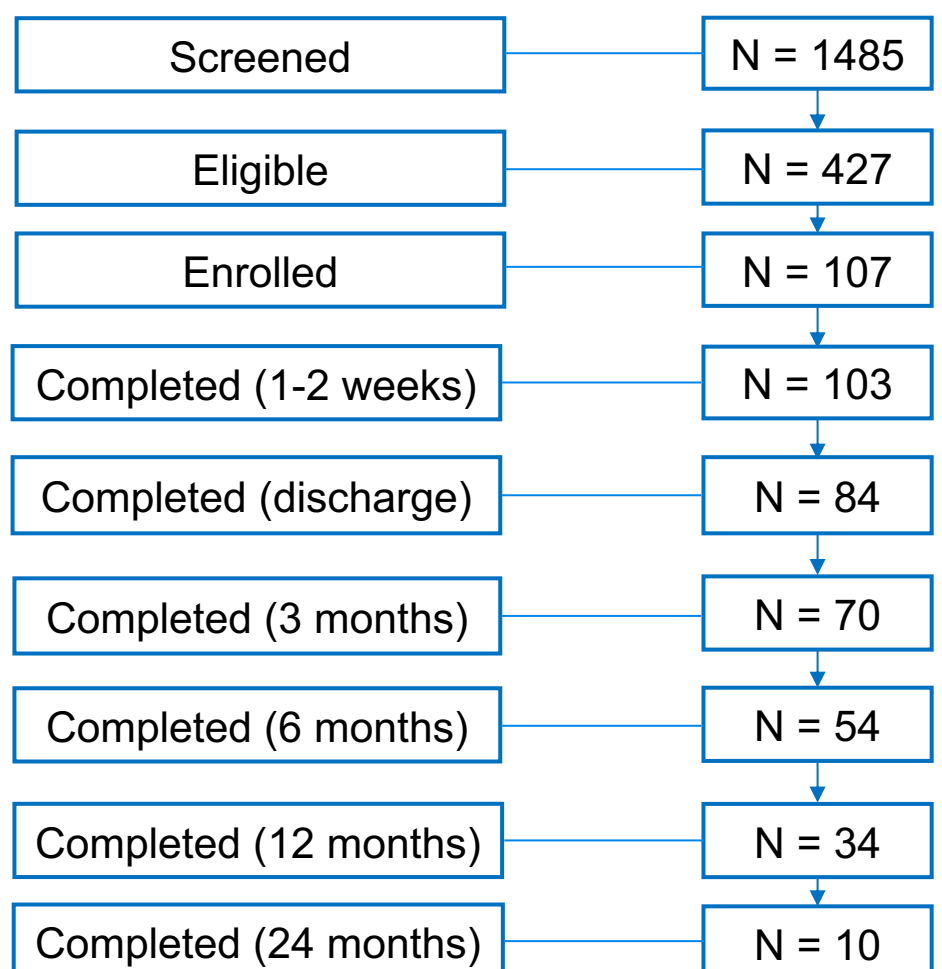
Inclusion/Exclusion Criteria

- Stroke confirmed by MD and brain imaging
- First time stroke and unilateral
- Asian ethnicity
- Age 21-90 years
- FMA-UE <66
- Capacity to communicate
- MoCA > 21

Demographics at baseline

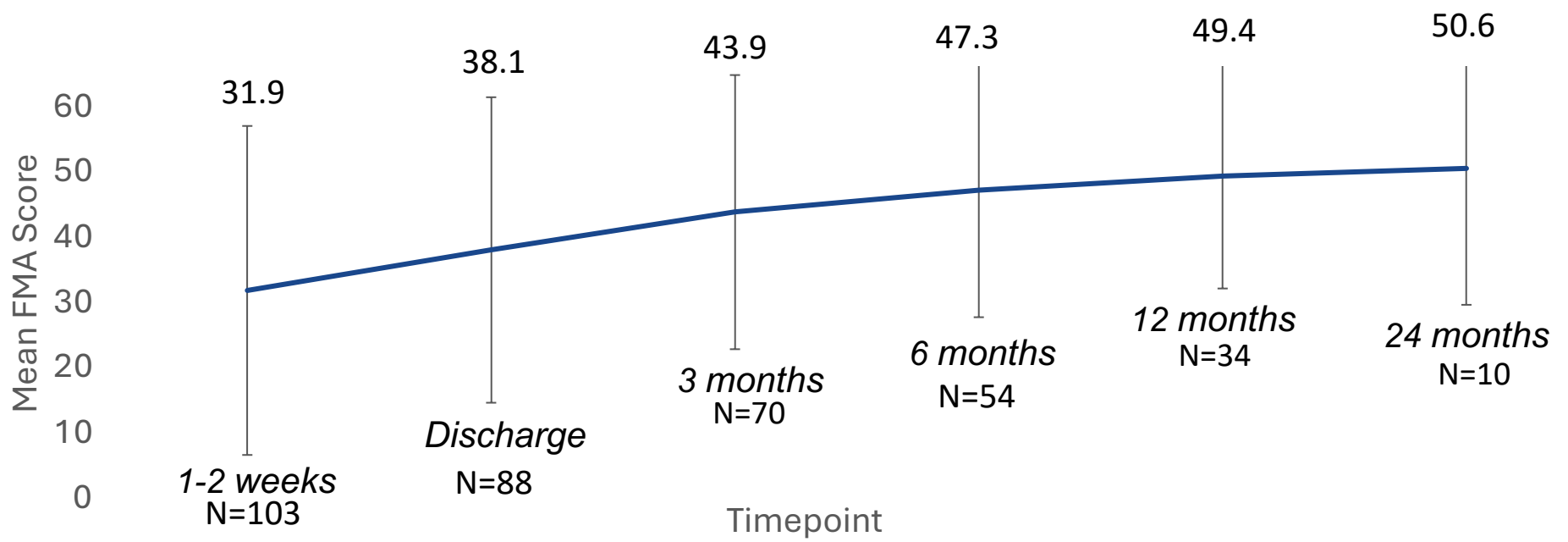
- N = 107 (Target N = 400)
- Sex: Male (67%), Female (33%)
- Race: 81% (Chinese), 15% (Malay), 1% (Indian), 3% (Others)
- Infarct (50.5%), Haemorrhage (49.5%)
- Affected UL: Left (64%), Right (36%)
- Dominant UL affected: Yes (39%), No (61%)

Flowchart

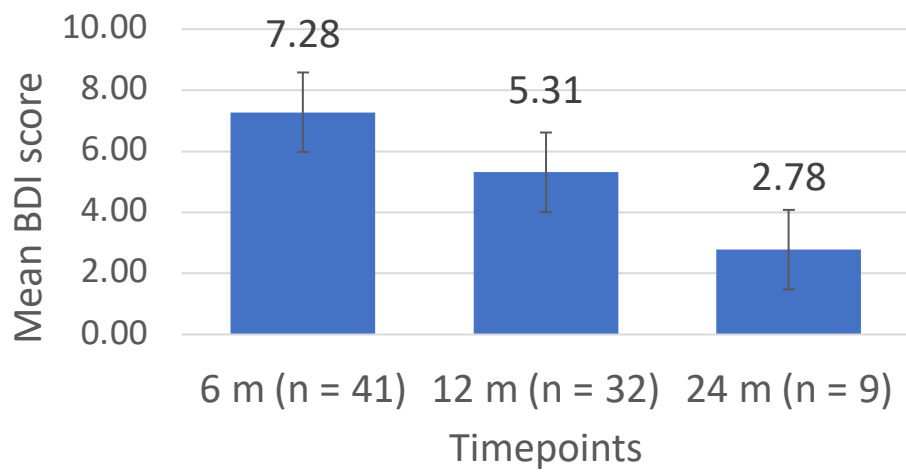


RESULTS

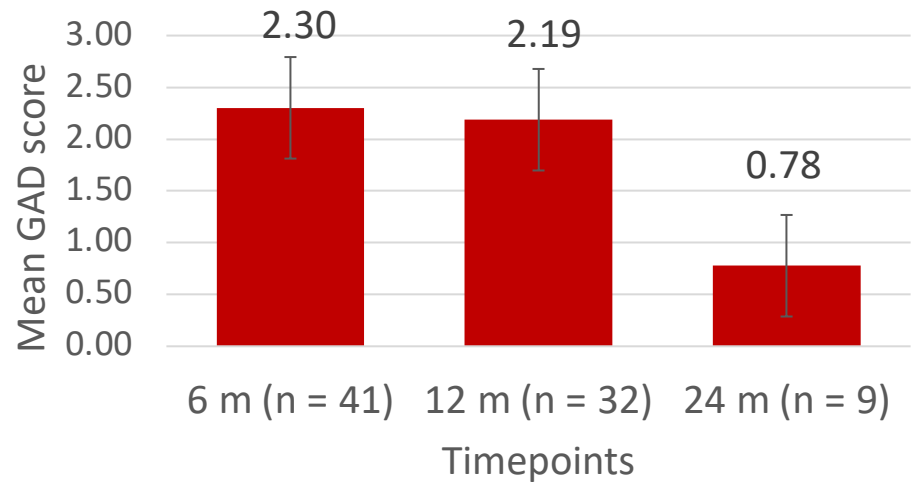
Fugl-Meyer UE



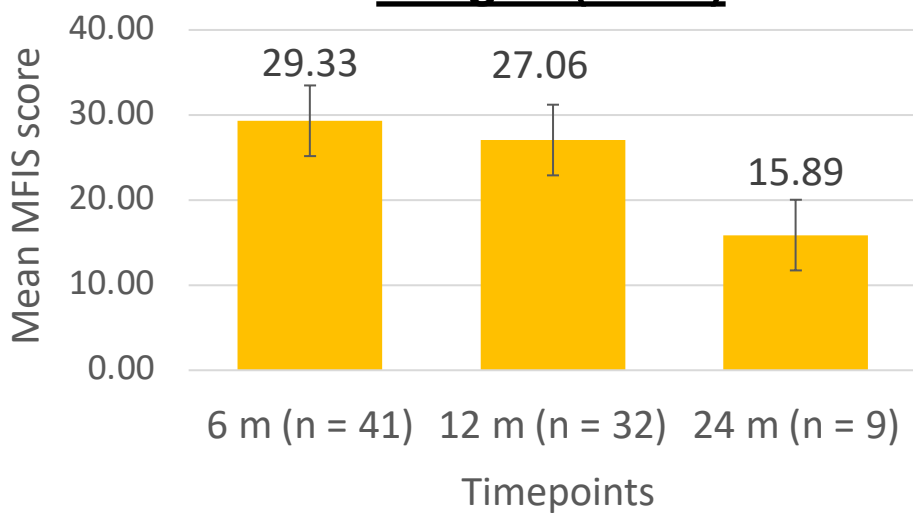
Depression (BDI)



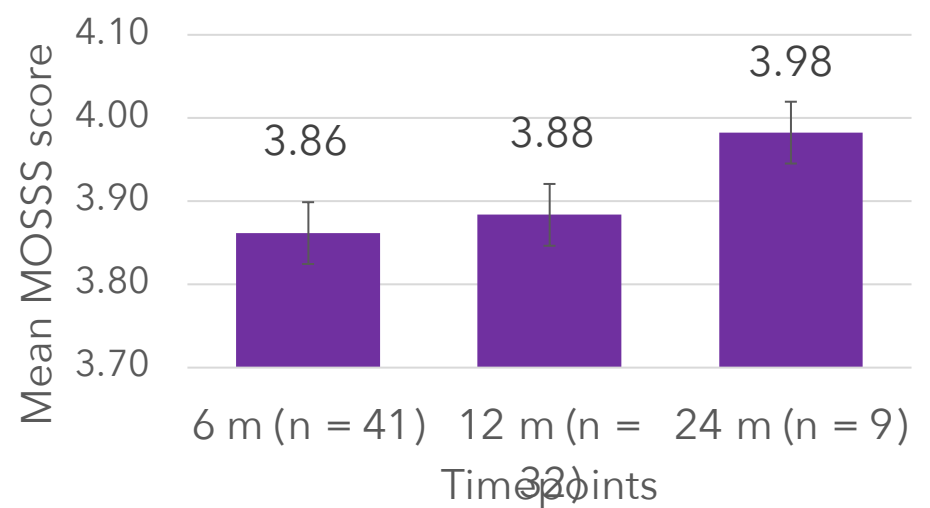
Anxiety (GAD)



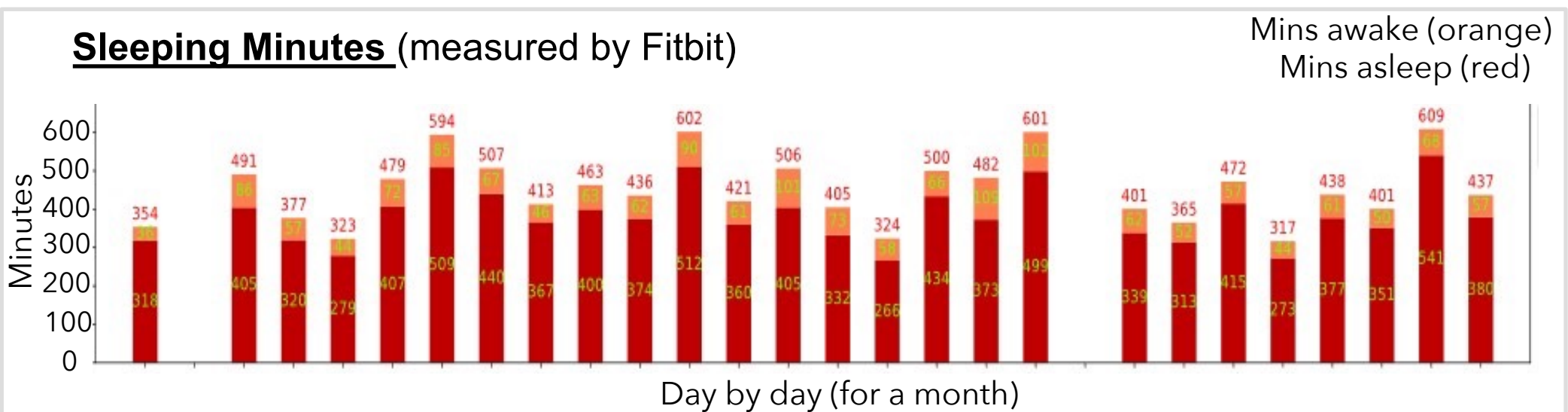
Fatigue (MFIS)



Social Support (MOSSS)



Sleeping Minutes (measured by Fitbit)



Preliminary Themes (Qualitative Interviews)

- Emotional turbulence**
 - "I get sad easily, and I also feel happy easily. I can't control my laughter."
- The recovery process**
 - "One year ago, I was in a wheelchair, and now I am not. So I can actually see progress which is one big difference already."
- Independence is a treasure**
 - "That was my worst time. I felt like an infant, lying there and not able to do anything."
- Acceptance is the way forward**
 - I have condition myself that I may have to live with this for don't know how many years. I sort of come to terms with it."

TAKE-HOME MESSAGE

- Deep phenotyping enables OT's to **personalize post-stroke rehab** through a **multidimensional, patient-centered approach**.
- Ongoing **integration of data with AI** aims to **predict individual recovery trajectories** and **inform prognosis and targeted intervention planning**.