Construct Validity of Daily Physical Behavior Complexity Metrics in Older Adults with Proximal Femoral Fracture

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FACTS & FIGURES

Start date:	01/04/2019
End date:	30/06/2024
IMI funding:	25.4 M€
EFPIA in kind:	24.5 M€
Other:	-
Total Cost:	49.9 M€
Project website:	https://mobilise-d.eu/
Social media:	LinkedIn: @mobilised
	YouTub: @Mobilise-D IMI_Project

CHALLENGE

A primary challenge is quantifying physical activity in a clinically meaningful way. While complexity metrics offer a promising solution, their construct validity has yet to be established. Therefore, this study aims to assess the convergent and divergent validity of daily physical activity complexity metrics by examining their associations with standard clinical measures and health indices.

APPROACH & METHODOLOGY

Mobilise-D Dataset: Clinical validation study

Cohort: Older adults recovering from Proximal Femoral Fracture at baseline assessment

- Age: 79 years,64.6% Female
- BMI: 24 kg/m^2, Systolic BP= 130 mmHG
- Hearing Impairment = 2/8
- Recovery stage: Non-acute (>14 days post-surgery)

Mobility assessment tests:

4MWT, SPPB, LLFDI

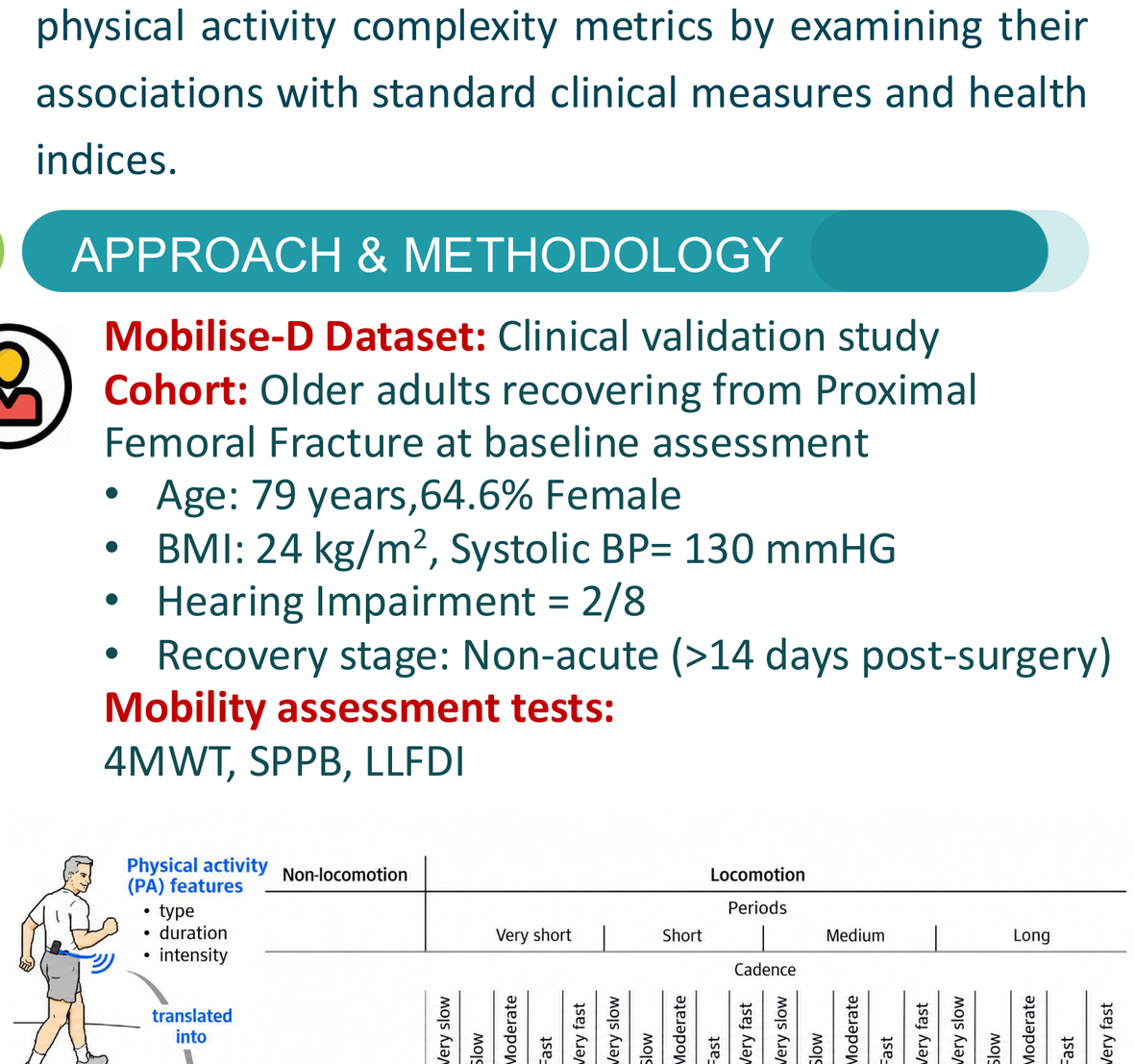


Fig. 1. Assessment of daily physical activity (PA) Complexity: definition multivariate PA states and illustrative example of multivariate patterns

RESULTS

Validity	Spearman Rank Correlation coefficients
Convergent	Correlation strength: very weak (< 0.3), weak (0.3–0.4), moderate (0.4–0.6), or strong (> 0.6).
Divergent	Correlation strength: very weak (< 0.2)

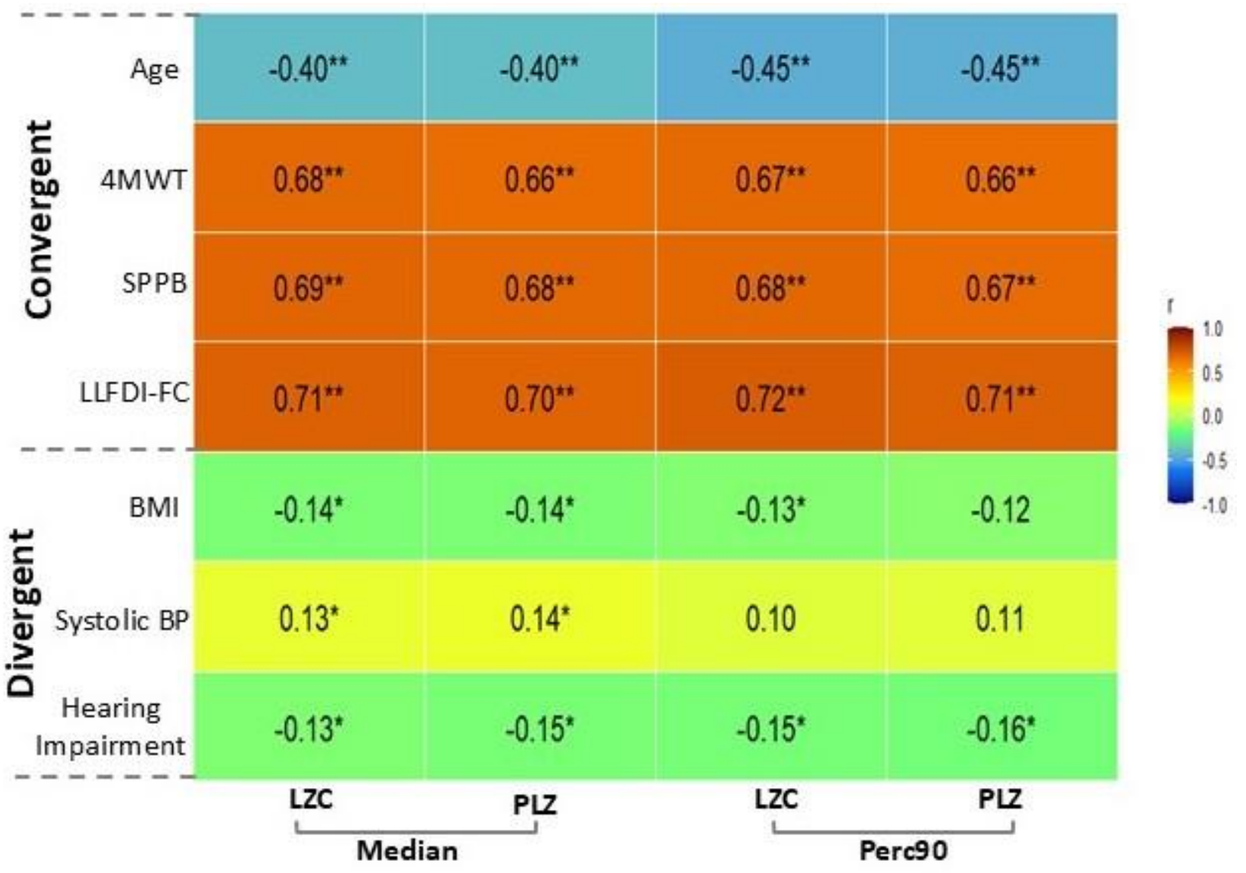


Fig. 2. Heat map plot illustrating the Spearman correlation values between median and 90th percentile (Per90) complexity metrics and clinical measures

- **Age:** Complexity metrics demonstrated a moderate negative convergent validity with age.
- **Mobility:** Complexity metrics showed moderate-to-strong positive convergent validity with mobility performance.
- **Health Indices:** Divergent validity was confirmed for standard health indicators (BMI, systolic BP, hearing impairment).

VALUE OF IMI COLLABORATION

Mobilise-D brought together over 300 researchers across 34 organizations across 10 different countries with the necessary technical, clinical, and regulatory expertise worked together over five years (2019-2024) to achieve the common goal of validating healthcare technology.

CAREER IMPACT

- Bridging Academia, Industry, & Regulation
- Universal Study Design and interdisciplinary collaboration
- Importance of contextual factors for interpretation of mobility dataset

Glossary

BP: Blood Pressure	**BMI:** Body Mass Index
PA: Physical Activity	4MWT: 4-meter Walking Test
PFF: Proximal Femoral Fracture	
SPPB: Short Physical Performance Battery	
LLFDI-FC: Late Life Function and Disability Index – Functional Component	
LZC: Lempel-Ziv complexity	
PLZ: Permutation Lempel-Ziv complexity	

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