Ecological validity of the 6 minute walking test in MS patients

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Background – Ecological Validity

„Ecological validity has typically been taken to refer to whether or not one can generalize from observed behaviour in the laboratory to natural behaviour in the world.“ (Schmuckler 2001)

Ecological validity:

- discussed in behavioural science since the 1950s
- not established in MS, rare in “biologic” science
- is a theoretical construct and denies formal testing
- depends on the entire setting of an experiment

Background – 6MWT and Accelerometry

6-Minute Walking Test (6MWT):

- Established in MS disease monitoring and as study endpoint
- Correlates well with EDSS, QoL and subjective measures of mobility

Mobile Accelerometry:

- Accelerometry allows walking speed measurement in real-life
- Walking speed declines with increasing age in healthy persons
- Walking speed shows differences between healthy persons and patients with MS
- Walking speed declines with increasing EDSS in MS

Goldman et al. (2008), Mult Scler
Gijbels et al. (2011), Mult Scler
Daumer M et al. (2007), Biomedical Engineering 52: 149-55
Schimpl et al. (2011), PLoS ONE 6(8): e23299. doi:10.1371/journal.pone. 0023299
Schimpl et al. (2011), PLoS ONE 6(8): e23080. doi:10.1371/journal.pone.0023080
Stellmann et al. (2011), ECTRIMS Abstract

Objectives

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Investigate the ecological validity of the 6MWT in MS with mobile accelerometry

Hypothesis:

Ecological Validity should be high, if…

- sequences of uninterrupted 6 Minutes walks are common

or

- 6MWT is associated with real-life walking speed

Study Overview

Methods

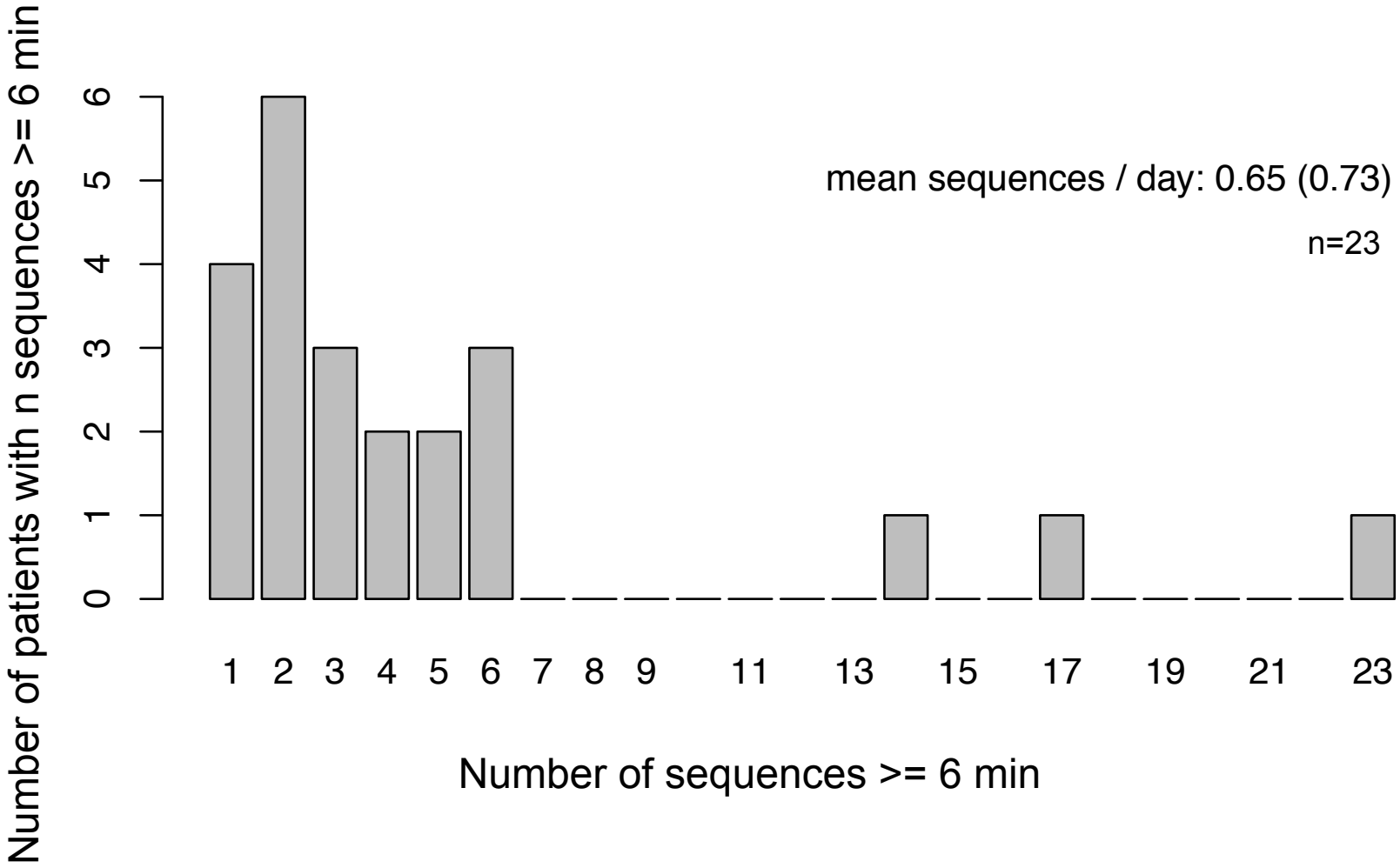
- 30 MS patients with mild/moderate impairment
- 6MWT (Rater and Accelerometry assessment)
- EDSS
- 7 days accelerometry measurement (actibelt)
- Descriptive statistics and Pearson's correlation

Demographic and Clinical Characteristics

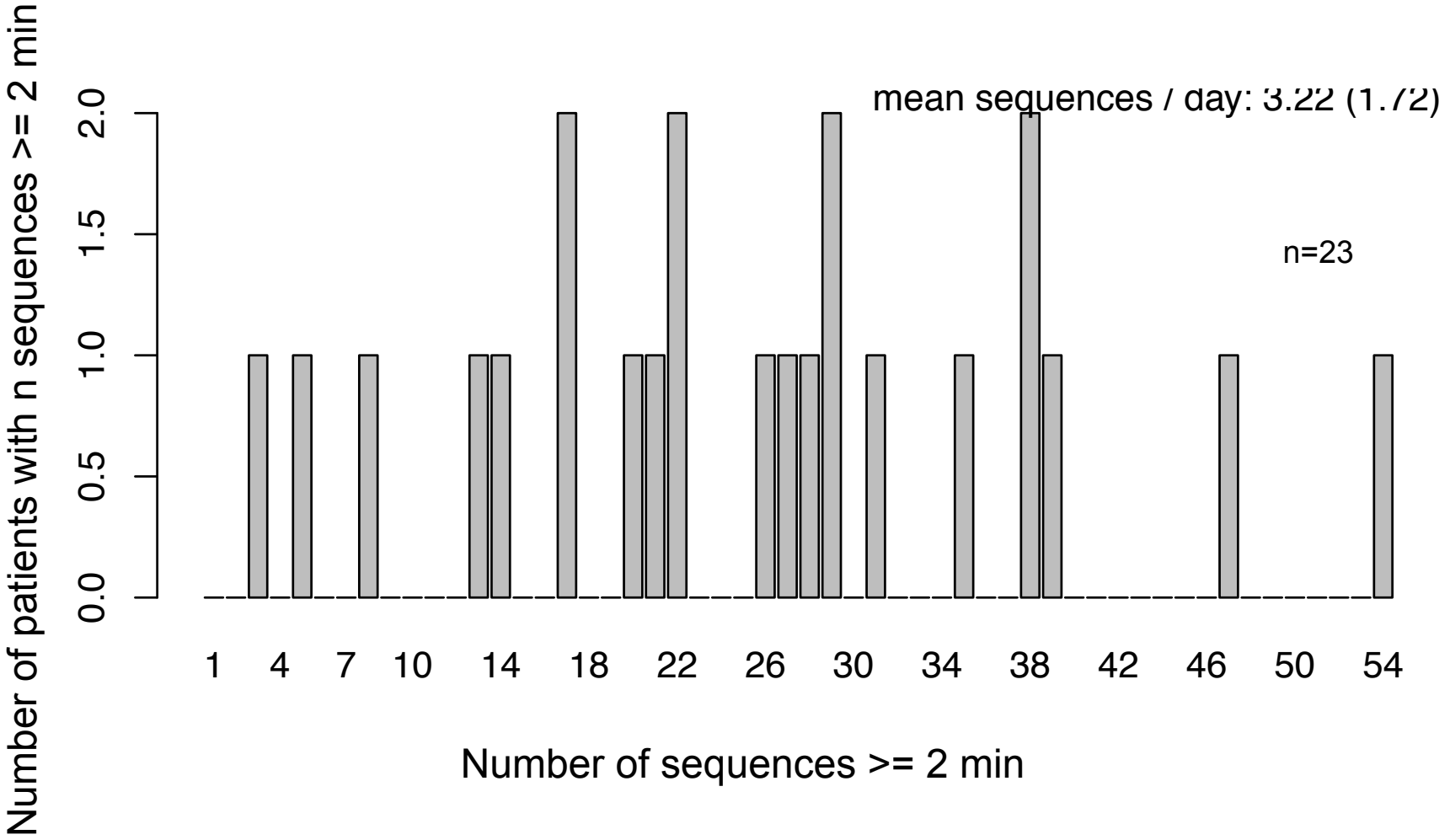
	(n=30)
Age (mean (sd))	44.4 (10.9)
Females (n (%))	20 (66.7%)
Disease course (n (%))	
RRMS	15 (51.7%)
SPMS	9 (31.0%)
PPMS	5 (17.2%)
Disease duration (mean (sd))	10.7 (7.2)
EDSS (mean (sd))	4.7 (2.4)
Clinical assessment	
500 m walk completed (n (%))	15 (50%)
6MWT completed (n (%))	25 (83%)*
Accelerometry	
Measurement days per patient (mean (sd))	7.1 (1.3)
Adherence hours per day and patient (mean (sd))	11.33 (2.8)
Exclusions due to algorhithm failure	2 (6,7%)

* EDSS <6.0

Results: Sequences of uninterrupted 6 minute walks in real-life

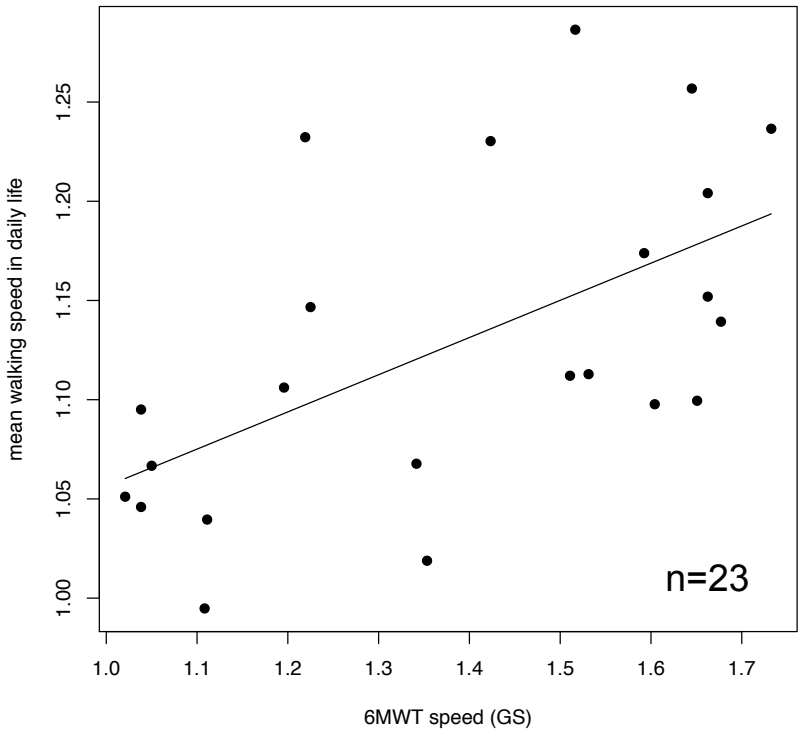


Results: Sequences of uninterrupted 2 minute walks in real-life



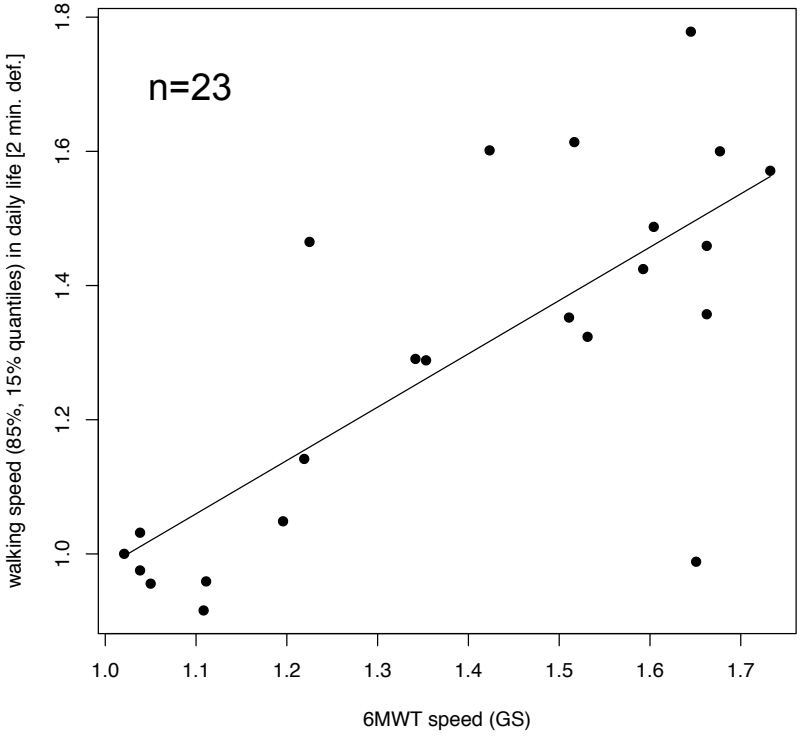
Results: Association between 6MWT and real-life walking speed

corr=0.577, R2=0.333, p<0.001



mean walking speed in daily life

corr=0.755, R2=0.570, p<0.001



85% quantile walking speed in daily life

corr=Pearson's correlation coefficient

Summary and Conclusion

- Uninterrupted walking sequences of 6 minutes or more are rare
- Even sequences of 2 Minutes do not occur very often
- 6MWT correlates better with the 85% quantile of daily-life walking speed than with mean walking speed

Conclusion:

- Ecological validity of 6MWT may be restricted
- The clinical question determines whether the 6MWT is sufficient or if long-term monitoring with mobile accelerometry is needed