StepuP: Steps against the b**u**rden of **P**arkinson's Disease

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JPND research
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Netherlands, Vrije Universiteit Amsterdam
Germany, University Hospital Schleswig-Holstein Kiel
Israel, Tel Aviv Sourasky Medical Center
Australia, University of New South Wales
Switzerland, Swiss Federal Institute of Technology (ETH Zürich)
Italy, IRCCS Istituto delle Scienze Neurologiche di Bologna

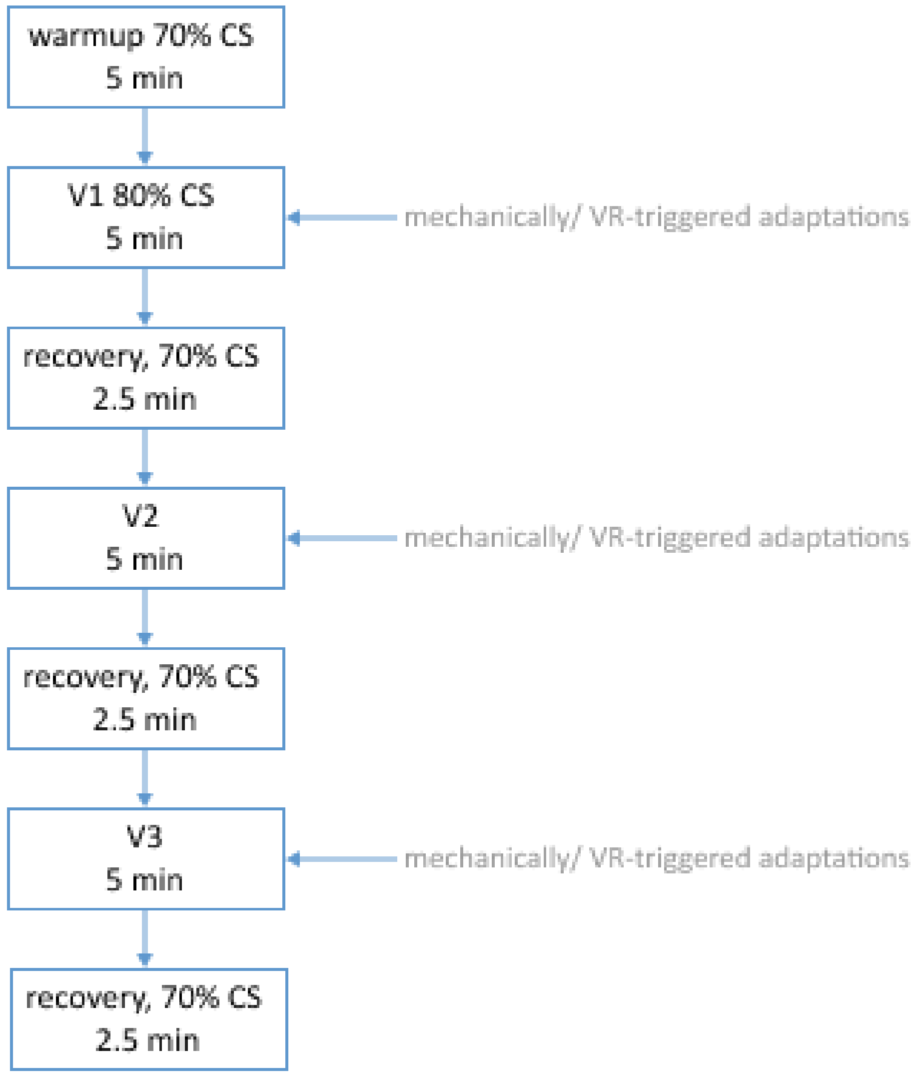
treadmill training in PD is effective

32 trials (n = 823) compared treadmill training with no exercise or sham treatment. Treadmill training improved gait outcomes, with a moderate effect on the 10MWT and a moderately large effect on gait speed.

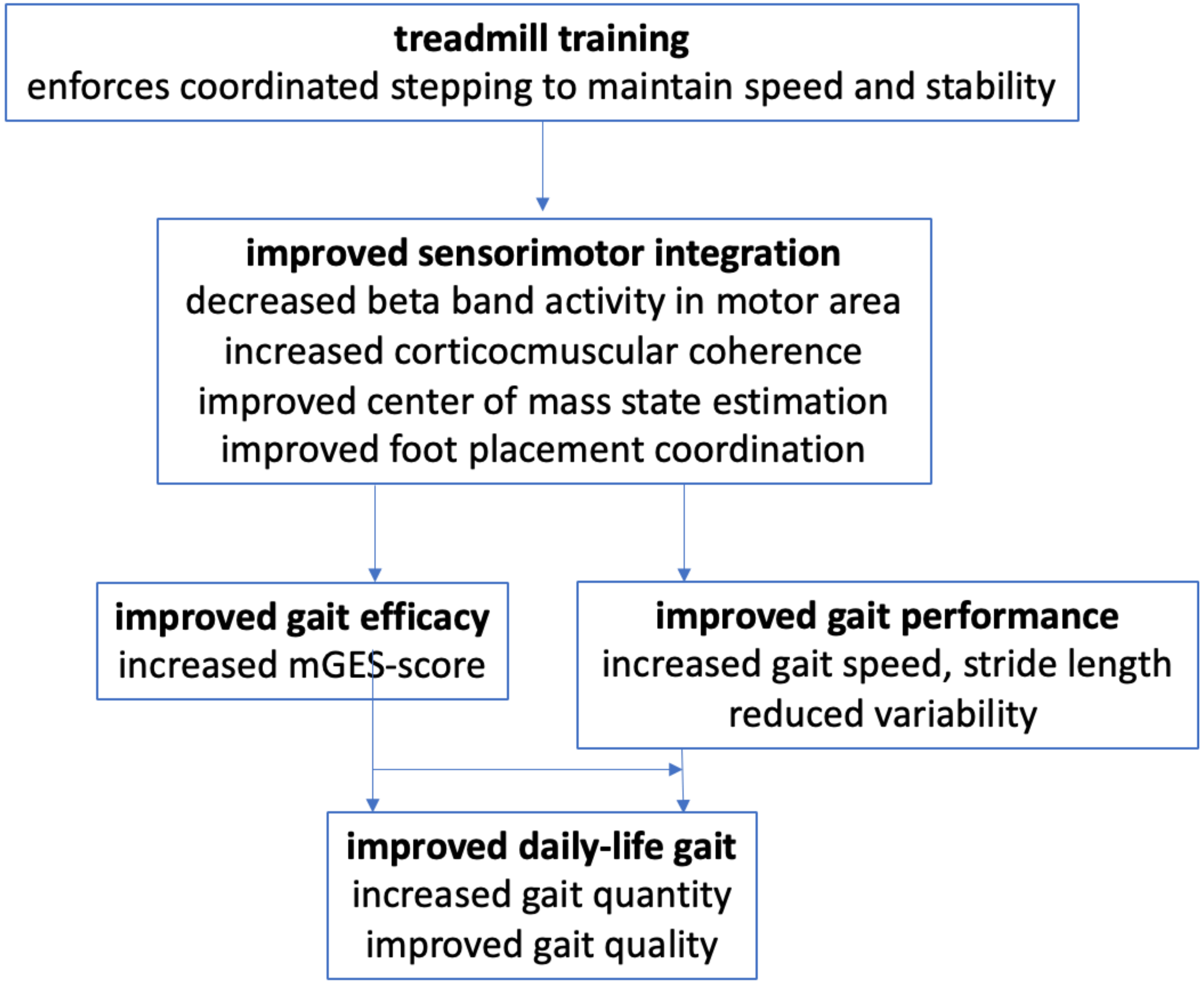
Radder et al. Neurorehabil Neural Repair 2020

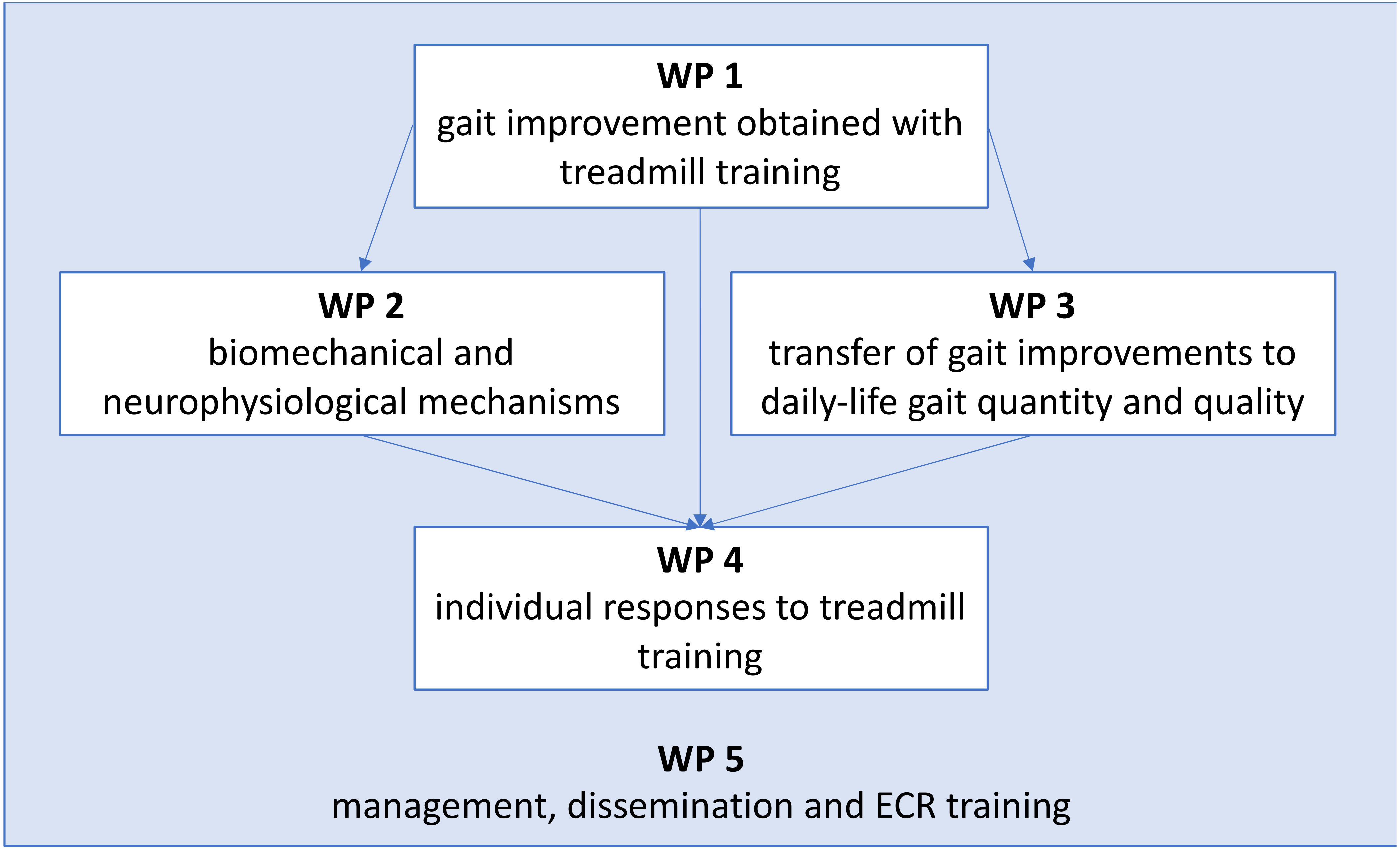
SDTT:
total walking distance 266 (82) m - 726 (93 ($P < 0.001$).
maximum 1.9 (0.75) km/h - 2.61 (0.77) km/h ($P < 0.001$).
Berg Balance Test ($P < 0.01$)
Dynamic Gait Index ($P < 0.01$)
Falls Efficacy Scale ($P < 0.01$).

Cakit et al. Clin Rehabil 2007



But why?


treadmill training
enforces coordinated stepping to maintain speed and stability
improved sensorimotor integration
decreased beta band activity in motor area
increased corticocmuscular coherence
improved center of mass state estimation
improved foot placement coordination
improved gait efficacy
increased mGES-score
improved gait performance
increased gait speed, stride length
reduced variability
improved daily-life gait
increased gait quantity
improved gait quality


WP 1
gait improvement obtained with treadmill training
WP 2
biomechanical and neurophysiological mechanisms
WP 3
transfer of gait improvements to daily-life gait quantity and quality
WP 4
individual responses to treadmill training
WP 5
management, dissemination and ECR training

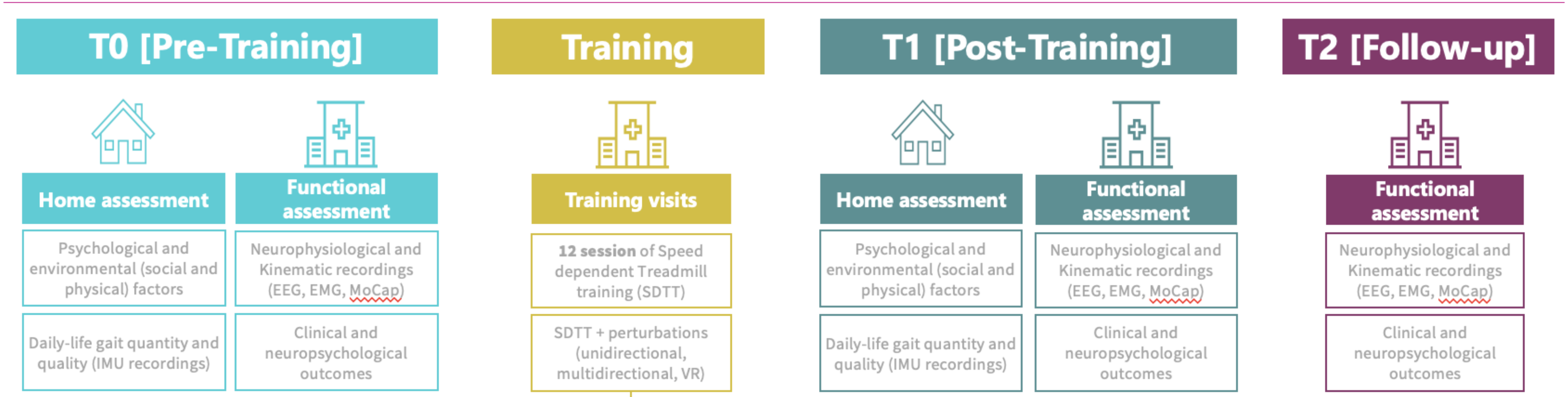


Figure 1. Protocol overview for the StepuP clinical centers.

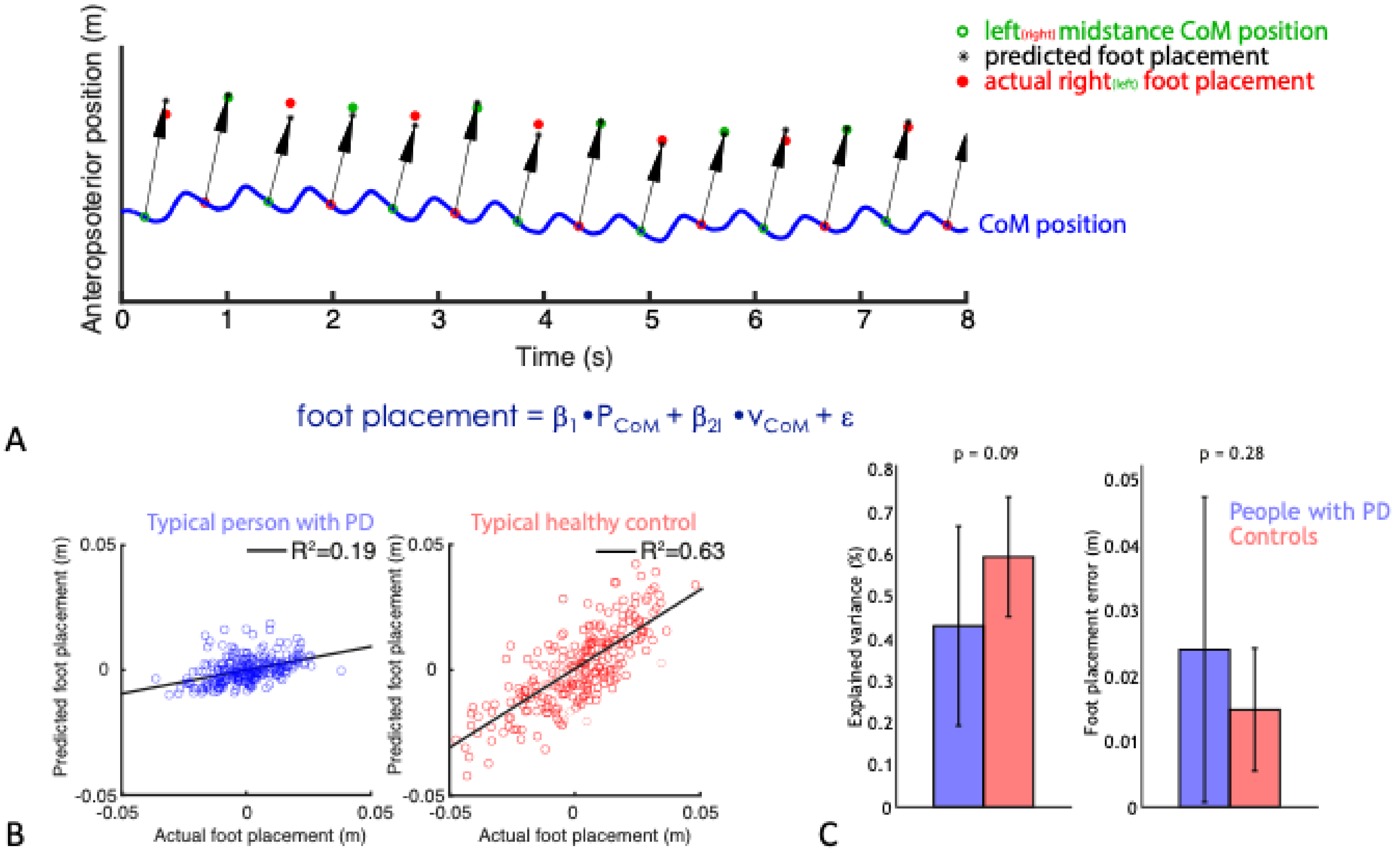
Primary outcome (WP1, Kiel)

- Walking speed and stride length
- Secondary;
  - timed-up-and-go (TUG) tes
  - 2-minute walk test74
  - balance and fall risk with the MiniBESTest
  - cognition using the MOCA76
  - motor symptoms of PD with the MDS-UPDRS, part III

Mechanisms (WP2, Amsterdam)

- Why does treadmill training (with perturbations) work?
  - improved foot placement coordination
  - improved center of mass state estimation
  - decreased beta band oscillations in sensorimotor areas
  - Increased corticulmuscular coherence

Mechanisms: foot placement coordination in PD

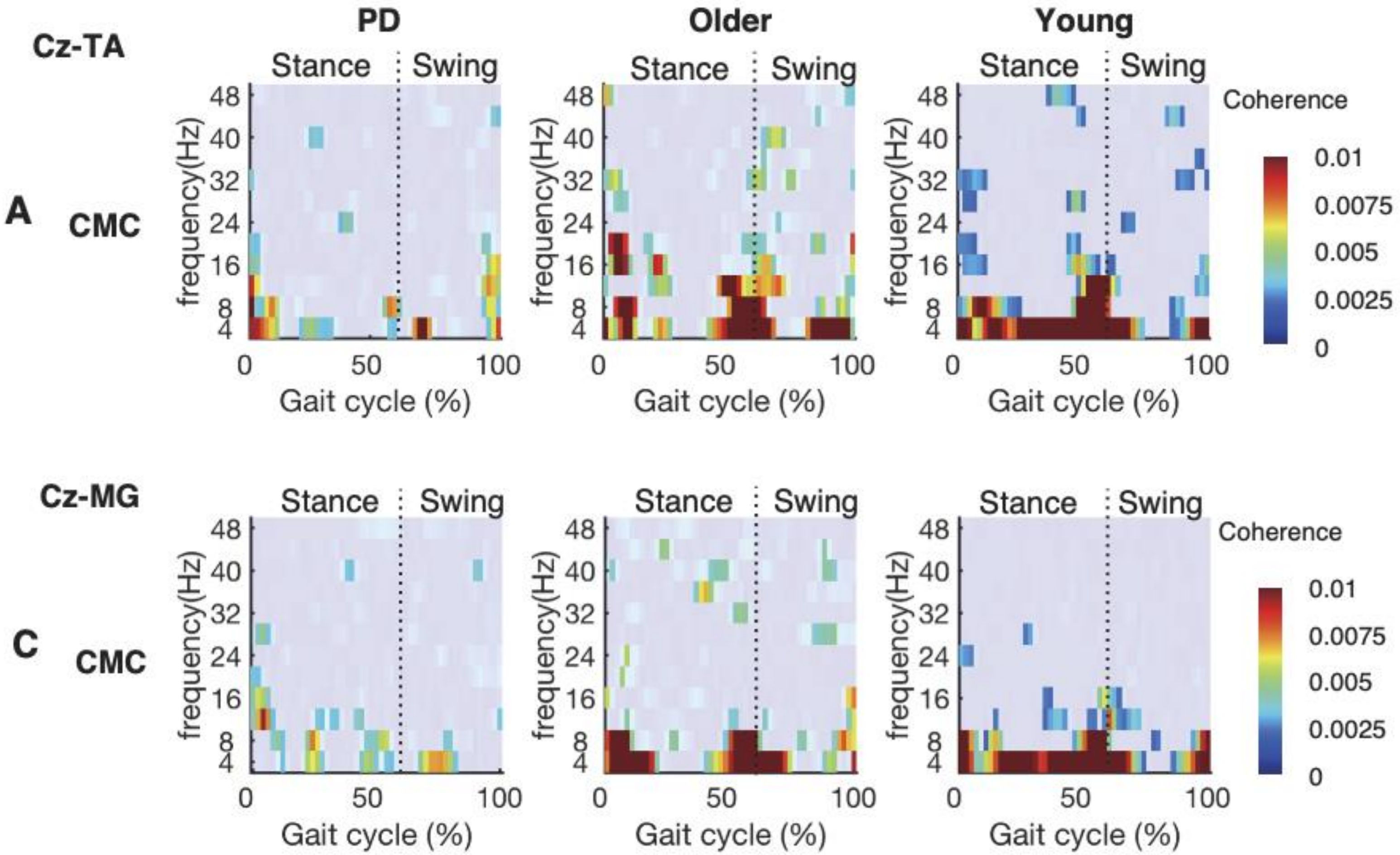


Mechanisms: cortico-muscular coherence in PD

Cz-TA 90–10% gait cycle (Terminal swing to weight acceptance)

Cz-TA 50–70% gait cycle (Pre-swing to initial swing)

Cz-MG 30–60% gait cycle (Mid-stance to pre-swing)



Yokoyama et al. J Neurophysiol 2020

Mechanisms (WP2, Amsterdam)

- Most important outcome is not these measures per-se, but correlation between these measures, and increases in primary outcome (WP1)

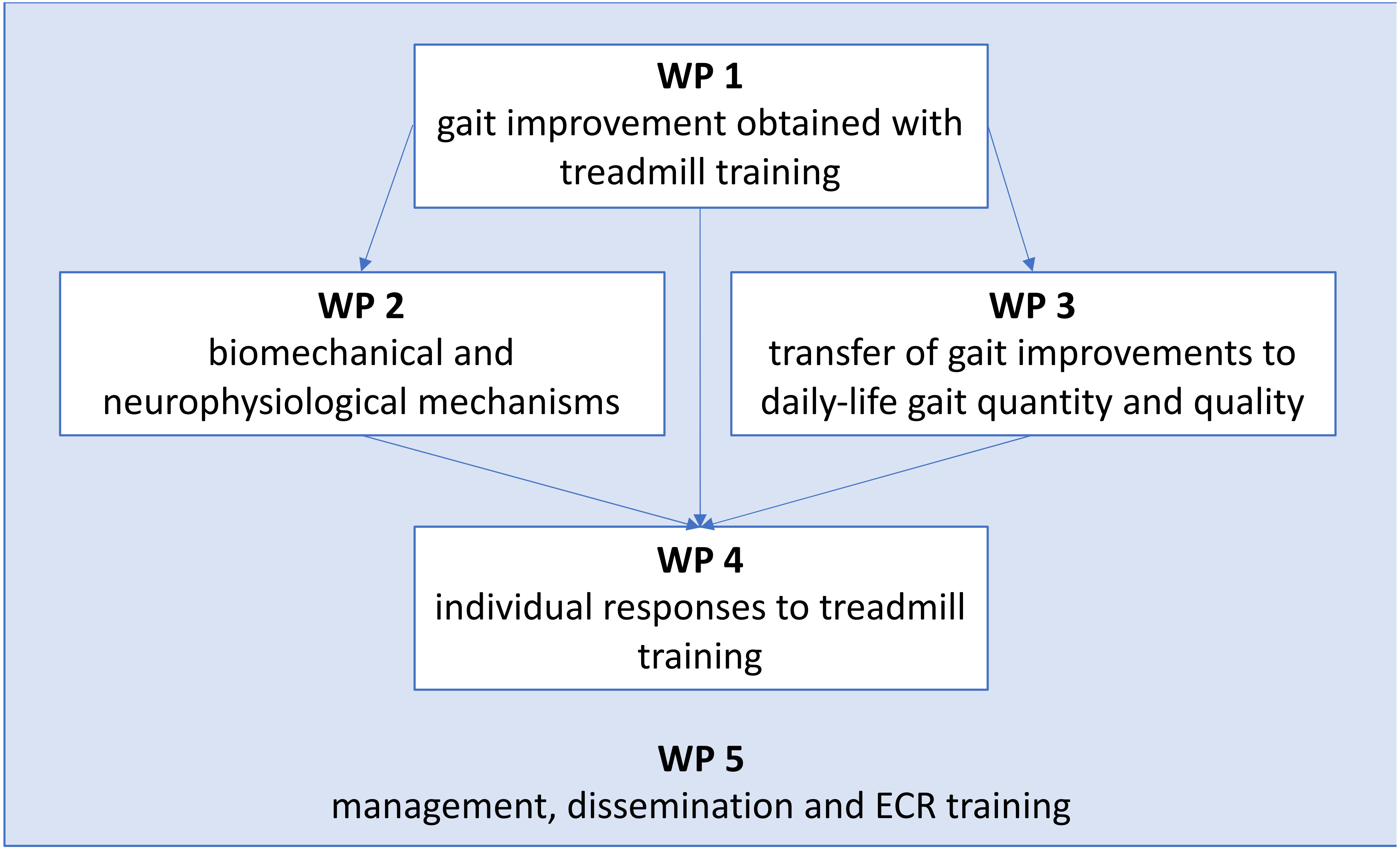
Daily life effects (WP3, Zurich)

- Amount of daily life activity
- Quality of daily life gait

- Expect improvements due to training

Bringing it together; WP4(Sydney)

- Qualitative analysis of treadmill training
- Combining data from all WP to understand for which patients treadmill training works best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