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Department für
Sportwissenschaft
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FAU
FRIEDRICH-ALEXANDER
UNIVERSITÄT
ERLANGEN-NÜRNBERG

FaST-PD
Cardiovascular Exercise to Facilitate Motor Skill Learning in Parkinson's Disease

Responsible Scientists: Philipp Wanner   **Senior Scientist**: PD Dr. Simon Steib

Associated researchers/ clinicians: Prof. Dr. Jochen Klucken, Prof. Dr. Jürgen Winkler

Funding: Deutsche Stiftung Neurologie (DSN)

External partners: -
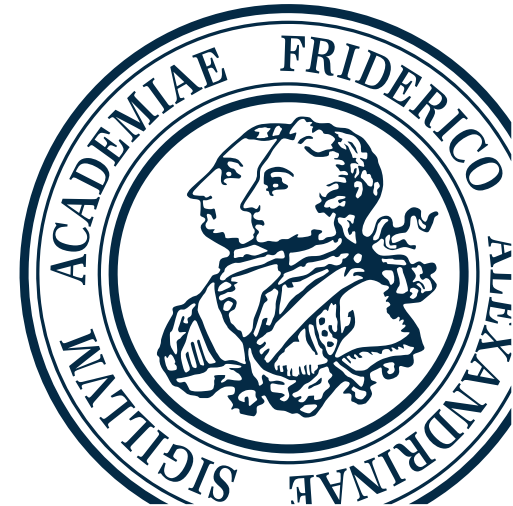
FaST - PD
Facilitating Motor **S**kill Learning by
Aerobic **T**raining in **P**arkinson's **D**isease
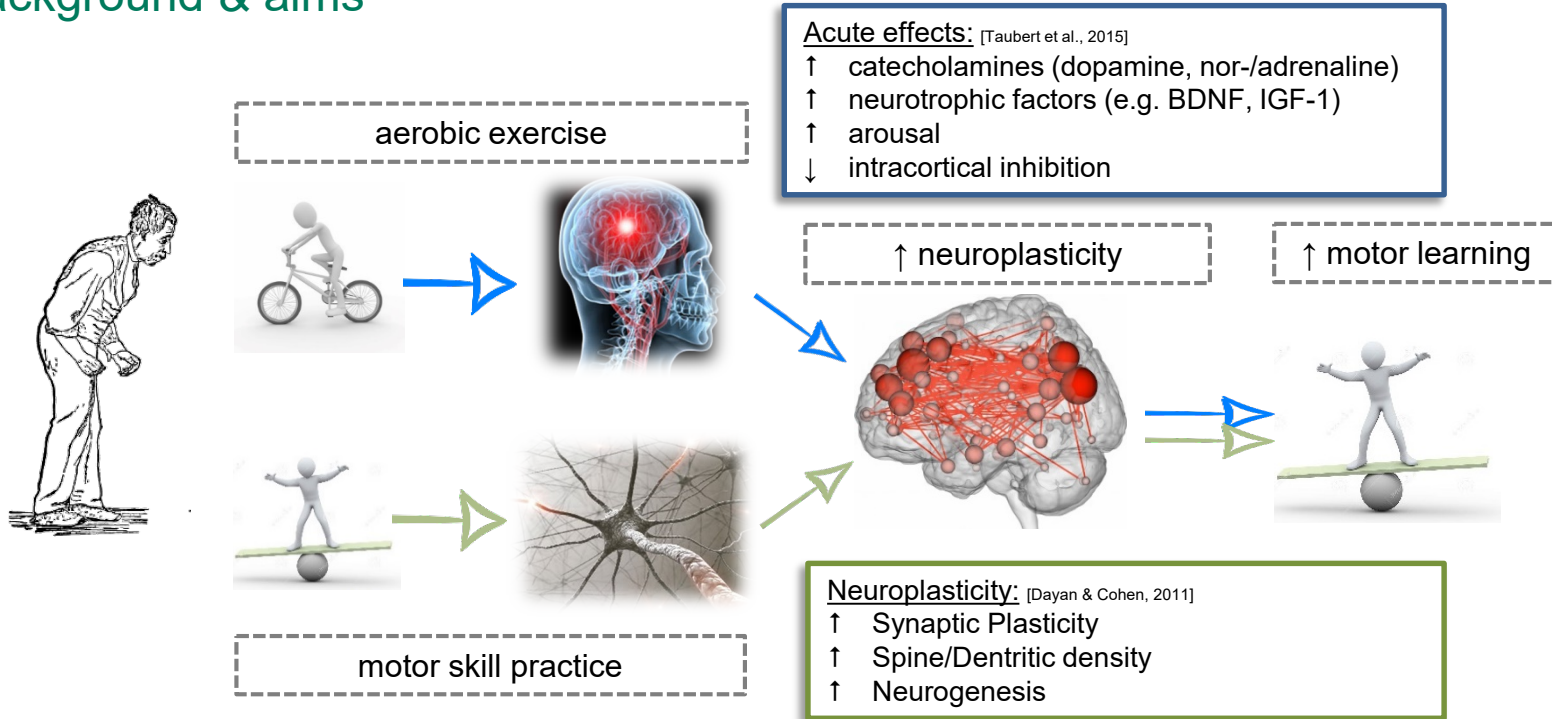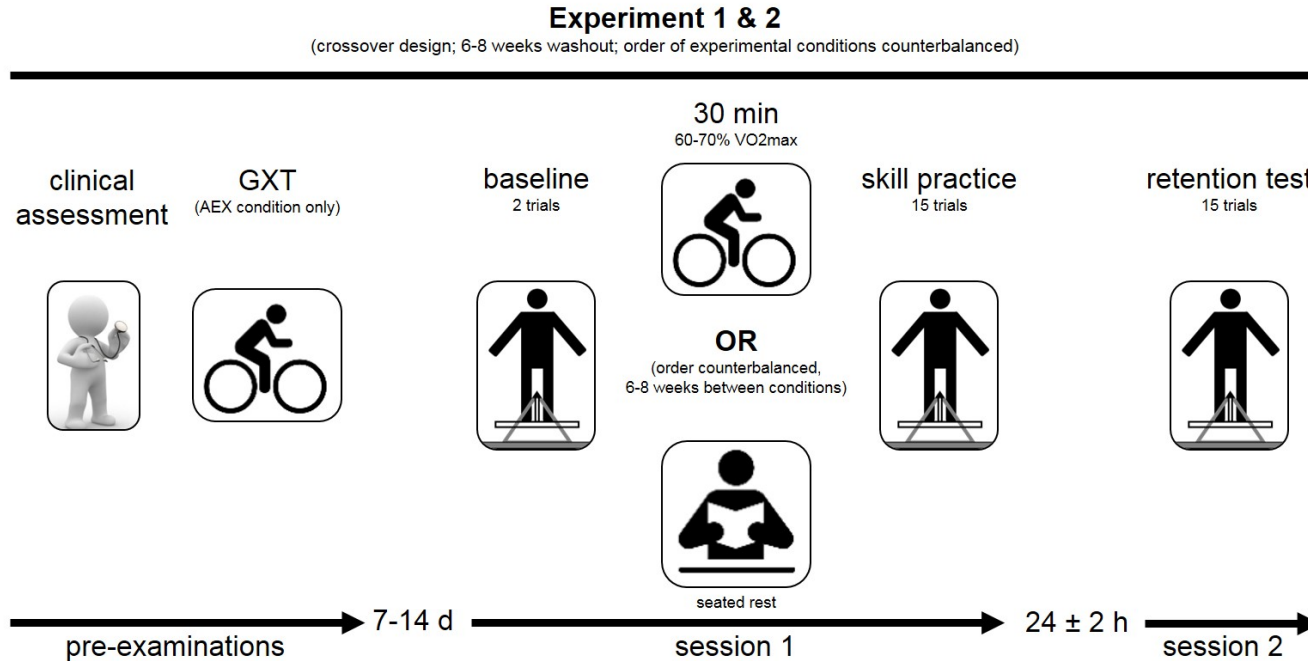
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Molekulare Neurologie
Ambulanz für Bewegungsstörungen

Background & aims

aerobic exercise

Acute effects: [Taubert et al., 2015]
↑ catecholamines (dopamine, nor-/adrenaline)
↑ neurotrophic factors (e.g. BDNF, IGF-1)
↑ arousal
↓ intracortical inhibition

↑ neuroplasticity

↑ motor learning

motor skill practice

Neuroplasticity: [Dayan & Cohen, 2011]
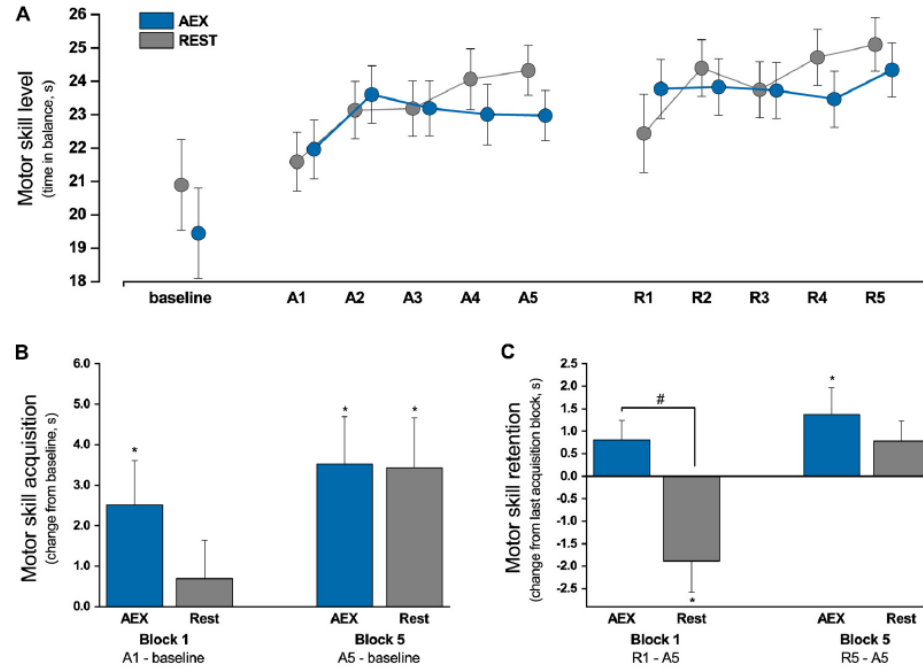↑ Synaptic Plasticity
↑ Spine/Dentritic density
↑ Neurogenesis

[Hillman et al., 2008; Petzinger et al., 2013; Roig et al., 2012; Roig et al., 2016; Taubert et al., 2015]

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Experimental flow

Experiment 1 & 2

(crossover design; 6-8 weeks washout; order of experimental conditions counterbalanced)

clinical assessment

GXT (AEX condition only)

baseline 2 trials

30 min 60-70% VO2max

OR (order counterbalanced, 6-8 weeks between conditions)

seated rest

skill practice 15 trials

retention test 15 trials

pre-examinations → 7-14 d → session 1 → 24 ± 2 h → session 2

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Findings

FIGURE 2 | Motor skill performance. **(A)** Motor skill performance (time in balance) during acquisition (A1–A5) and retention (R1–R5); **(B)** online skill gains illustrated as change from baseline block to first (A1) and last (A5) acquisition block, *significantly different from baseline (paired t-test $p \le 0.036$); **(C)** motor skill retention illustrated as change from last acquisition block (A5) to first (R1) and last (R5) retention block, *significantly different from baseline (paired t-test $p \le 0.036$), #significant difference between aerobic exercise (AEX) and REST condition ($F_{1,32} = 10.734$, $p = 0.003$); error bars indicate 1 SE.

[Steib et al. Front Aging Neurosci, 2018]