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Neuroprotective Exercise Protocol (NEP) improves Parkinsons disease (PD) mobility:

Transferring evidence into practice

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Introduction

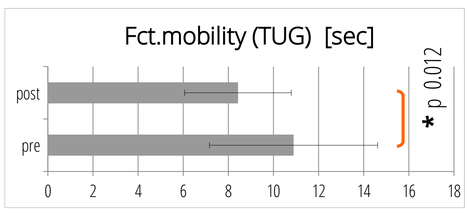
This retrospective cohort study examined the effects of a neuroprotective exercise protocol (NEP) for people with Parkinsons Disease (PD). PD-animal models and human studies with PD suggest that exercise may be neuroprotective and neurorestaurative (1,2) and hence slow down disease progression (3). Rhythmic, lower extremities and reflex-based movements, e.g. walking and running correlate with the output of brain derived neurotrophic factor (BDNF). This nerve-growth-factor is attributed to neuroplasticity, neurogenesis and neuroprotection (4). We concluded in our previous work (5), that restoring, stabilizing and progressing mobility (in particular gait & dynamic balance) is the main objective in PD and we defined the terms "locomotor-restauration" and "locomotor-progression" as a concept to fulfill the goal of neuroprotection.

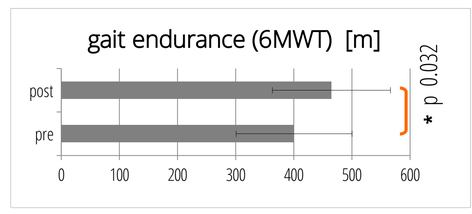
Subjects

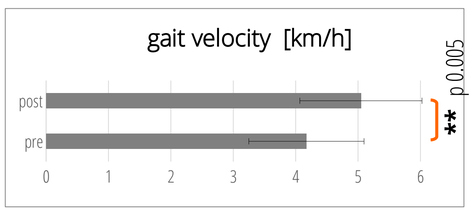
Nineteen people with PD (aged 68 ± 8 years; Hoehn & Yahr I-III (mean 1,8 ± 0,8)) were included. The NEP-group participated in a personal training condition in the *neurowerkstatt*-training-center (Pfungstadt, GER) between 2015 and 2017.

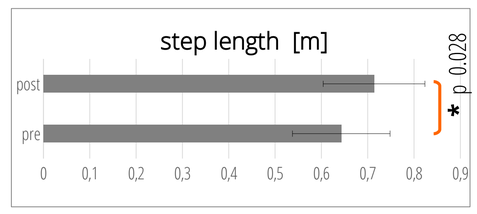
Results

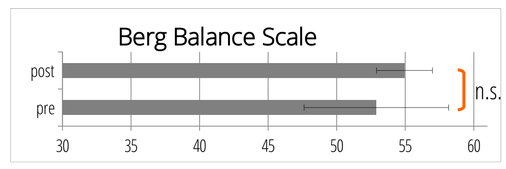
The statistical analysis with paired students t-test (two-sided, n = 19, homogeneous variance (F-Test)) showed significant improvements after NEP for *functional mobility* and *gait parameters* (see graphs below). *Balance* showed a statistical trend (*BBS*: p = 0.063).











Neuroprotective exercise protocol

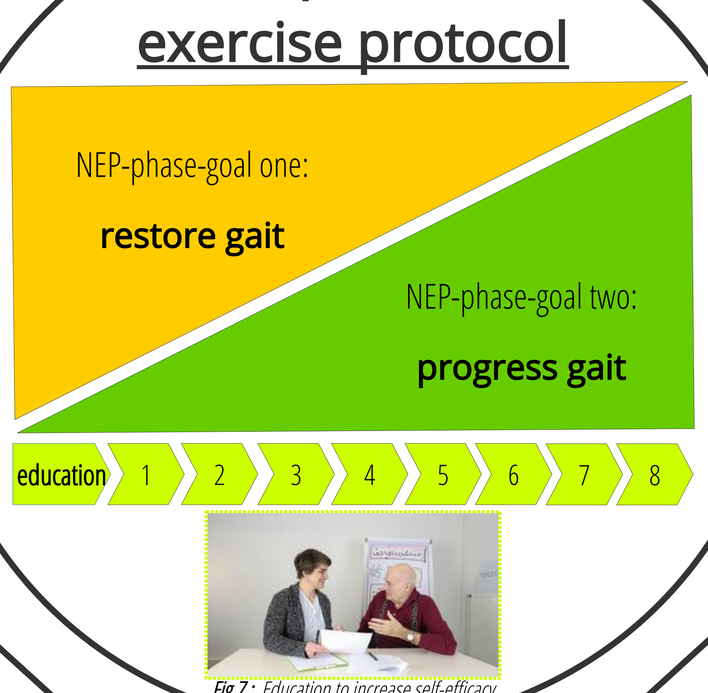


Fig.1 : Gait variability training – phase one.

Fig.2 : Training with external cueing – phase one.

Fig.3 : Randomised whole-body-vibration training – phase one.

Fig.4 : Treadmill training – phase two.

Fig.5: Intensified gait training – phase two.

Fig.6 Progressed running training – phase two.

Fig.7 : Education to increase self-efficacy

Methods

Clinical parameters of mobility, gait and balance were measured at the beginning and the end of 10 sessions: Timed-up-and-go-test (TUG), Berg-Balance-Scale (BBS), step length (sl) and gait-velocity (v) through 10-meter-walk-test (10MWT) and gait endurance with the 6-minute-walk-test (6MWT).

Intervention

The training method is based on Schwed 2015 (5). The 10 sessions were structured in a 2-phase-goal:

① **restore gait** and ② **progress gait.**

In the first part PD-focused coordination training (e.g. randomized whole-body-vibration, gait-variability, external-cueing) were used. In the second part endurance-training and intensified gait training (e.g. treadmill, running) were used. Attendant, PD-subjects were educated within 8 modules (see box *'Education modules'*) to increase self-efficacy. To our knowledge this is the first study that aims optimal and neuroprotective exercise training strategies combined with education for self-efficacy for people with PD.

Education modules

1 Parkinson disease basics
2 Motor comfort zone
3 Gain through exercise
4 Neuroplasticity/-protection
5 Training methods
6 Barrier-management
7 Motivation techniques
8 Volition & planning

Discussion

The NEPs main goal is to restore and improve gait to have an impact in a molecular vicious circle with disease related loss of BDNF, and therefore has a fundamental impact on mobility (6).

The NEP 2-phase-goals were also based upon further numerous human and animal RCT-exercise-studies with PD. The significant improvements on mobility parameters confirm current laboratory findings in a practical application setting. The guided NEP-program comprised also education modules to subsidize PD-patients in the self-management of home exercise activities as an effective method to improve self-efficacy. This also contributed to the significant improvements of the mobility parameters.

Study limitations are a small sample and possible bias effects of the sample that might be motivated through monetary obligations and an intrinsic motivation to choose an expert training program.

Conclusion

We conclude that the NEP is an effective exercise strategy to improve mobility, and hence to improve gait abilities and disease symptoms, and maybe slow down disease progression as animal models suggest. Futher research is needed.

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Selected literature
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