Evidence for Exercise of Gait Disturbances in PD in the Early Phase

Dr. N.M. (Nienke) de Vries
Inactivity AND Parkinson’s disease

- Cardiovascular disease
- Osteoporosis
- Insomnia
- Cognitive decline
- Depression
- Constipation

All cause mortality
Positive effects of exercise

- Generic health benefits
- Specific additional benefits in PD
- Disease-modifying effects ??

GAIT
Starting point
Physiotherapy in Parkinson’s Disease: A Meta-Analysis of Present Treatment Modalities

Danique L. M. Radder, MD¹,*, Ana Lígia Silva de Lima, PhD¹,*, Josefa Domingos, MSc¹,², Samyra H. J. Keus, PhD¹,³, Marlies van Nimwegen, PhD¹, Bastiaan R. Bloem, MD, PhD¹, and Nienke M. de Vries, PhD¹
## Efficacy on outcomes per type of intervention

<table>
<thead>
<tr>
<th></th>
<th>Motor Symptoms</th>
<th>Balance outcomes</th>
<th>Gait outcomes</th>
<th>Quality of Life outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(MDS-) UPDRS</td>
<td>TUG</td>
<td>BBS</td>
<td>6MWT</td>
</tr>
<tr>
<td>Conventional</td>
<td>0.48 [0.35, 0.60]**</td>
<td>0.11 [-0.07, 0.29]</td>
<td>0.03 [-0.26, 0.31]</td>
<td>0.13 [-0.01, 0.28]</td>
</tr>
<tr>
<td>PT (n=45)</td>
<td>n=26</td>
<td>n=14</td>
<td>n=3</td>
<td>n=6**</td>
</tr>
<tr>
<td>Resistance training</td>
<td>0.20 [-0.02, 0.42]</td>
<td>0.19 [-0.05, 0.43]</td>
<td>0.31 [-0.47, 1.09]</td>
<td>0.67 [0.09, 1.24]</td>
</tr>
<tr>
<td></td>
<td>n=7</td>
<td>n=6</td>
<td>n=1</td>
<td>n=2**</td>
</tr>
<tr>
<td>(n=17)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treadmill training</td>
<td>0.10 [-0.09, 0.29]</td>
<td>0.07 [-0.19, 0.34]</td>
<td>0.21 [-0.13, 0.55]</td>
<td>0.29 [0.04, 0.55]*</td>
</tr>
<tr>
<td></td>
<td>n=16</td>
<td>n=8</td>
<td>n=5</td>
<td>n=9**</td>
</tr>
<tr>
<td>(n=32)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strategy training</td>
<td>0.43 [-0.32, 1.18]</td>
<td>0.53 [0.23, 0.82]</td>
<td>0.12 [-0.43, 0.68]</td>
<td>-0.02 [-0.90, 0.85]</td>
</tr>
<tr>
<td></td>
<td>n=1</td>
<td>n=6**</td>
<td>n=1</td>
<td>n=1</td>
</tr>
<tr>
<td>(n=14)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dance (n=11)</td>
<td>0.72 [0.44, 1.01]</td>
<td>0.49 [0.19, 0.80]</td>
<td>0.59 [0.27, 0.91]</td>
<td>0.51 [0.10, 0.91]</td>
</tr>
<tr>
<td></td>
<td>n=8**</td>
<td>n=8**</td>
<td>n=7**</td>
<td>n=4**</td>
</tr>
</tbody>
</table>
Randomized Controlled Trial of Community-Based Dancing to Modify Disease Progression in Parkinson Disease

Ryan P. Duncan, MPT¹ and Gammon M. Earhart, PhD¹
Tango
Efficacy on outcomes per type of intervention

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Symptoms</th>
<th>Balance outcomes</th>
<th>Gait outcomes</th>
<th>Quality of Life outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(MDS-) UPDRS</strong></td>
<td><strong>TUG</strong></td>
<td><strong>BBS</strong></td>
<td><strong>6MWT</strong></td>
<td><strong>10MWT</strong></td>
</tr>
<tr>
<td><strong>Martial arts</strong> (n=11)</td>
<td>0.26 [0.08, 0.43]</td>
<td>0.56 [0.36, 0.77]</td>
<td>0.24 [-0.02, 0.49]</td>
<td>0.20 [-0.15, 0.55]</td>
</tr>
<tr>
<td><strong>Nordic walking</strong> (n=3)</td>
<td>0.74 [0.24, 1.24]</td>
<td>0.55 [0.06, 1.04]</td>
<td>0.99 [0.48, 1.50]</td>
<td>0.94 [0.28, 1.60]</td>
</tr>
<tr>
<td><strong>Aerobic exercises (n=5)</strong></td>
<td>0.92 [0.61, 1.22]</td>
<td>0.80 [0.44, 1.15]</td>
<td>1.02 [0.69, 1.34]</td>
<td>n=2</td>
</tr>
<tr>
<td><strong>Balance and gait training</strong> (n=28)</td>
<td>0.34 [0.11, 0.56]</td>
<td>0.36 [0.15, 0.58]</td>
<td>0.57 [0.35, 0.79]</td>
<td>-0.12 [-0.48, 0.23]</td>
</tr>
</tbody>
</table>

*Significance level: p < 0.05
**Significance level: p < 0.01
Effectiveness of home-based and remotely supervised aerobic exercise in Parkinson’s disease: a double-blind, randomised controlled trial

Nicolien M van der Kolk, Nienke M de Vries, Roy P C Kessels, Hilde Joosten, Aeilko H Zwinderman, Bart Post, Bastiaan R Bloem

Summary

Background High-intensity aerobic exercise might attenuate the symptoms of Parkinson’s disease, but high-quality evidence is scarce. Moreover, long-term adherence remains challenging. We aimed to evaluate the effectiveness of aerobic exercise—gamified and delivered at home, to promote adherence—on relieving motor symptoms in patients with Parkinson’s disease with mild disease severity who were on common treatment regimes.
Parkinson patients with a sedentary lifestyle

Baseline assessment

Random allocation

Intervention
- Aerobic exercise (Exergaming)
- Coach
- Motivational app

Active Control
- Stretching
- Coach
- Motivational app

30-45 min/session, 3/week, 6 months

Postintervention assessment at 6 months
Remote control from Nijmegen

Download: real time & post hoc training output

Upload: new individual training schemes

Patient’s home

Radboud University Nijmegen

Park in Shape

Radboudumc
Signing up is not enough!
Sporten

Uw doel deze week
Sport minimaal 3 keer, maar probeer het 5 keer te doen!

Sportopdracht

Volgende conditiecheck deze week
Zee week 3e week 4e week 5e week 6e week 7e week

Sportagenda
Help uzelf en plan uw afspraken in, zodat u en uw patiënten deze kunt verhogen.

Afgezet
Zieken of afgezet? Zorg dat uw coach en supporters niet bijzondere afspraken krijgen.

Nu Sporten

Uw fiets prikdaad: 05 18

Doel:
Fietstennis 30 minuten met uw hartslag in de aangegeven hartslagzone. Doe dit met de aangegeven

Tijd: 30 min
Hartslagzone: 125 - 155 bpm
Calorieën: 50 - 80 pm

Doel behalen:
Pak tijdens het fietsten die snellere verenigingen uw tempo aan. Zodat uw hartslag is in de aangegeven hartslagzone, komt en blijft.

Let op:
- Begin elke training met enkele minuten opwarmen.
- Het kan even duren voor uw hartslag in de hartslagzone is.
Delta UPDRS III (in OFF phase)

Difference 4.2 points (95% CI: 1.6 – 6.9); p=0.002
Delta VO2max (ml/kg/min)

Aerobic intervention: Difference 4.2 points (95% CI: 1.6 – 6.9) p < 0.001

Active control
Effect of Aerobic Exercise

Current Perspectives on Aerobic Exercise in People with Parkinson’s Disease

Sabine Schootemeijer - Nicolen M. van der Kolk - Bastiaan R. Bloem - Nienke M. de Vries

© The Author(s) 2020

Abstract
Parkinson’s disease (PD) is a progressive neurological disorder characterized by motor and non-motor symptoms for which only symptomatic treatments exist. Exercise is a widely studied complementary treatment option. Aerobic exercise, defined as continuous movement of the body’s large muscles in a rhythmic manner for a sustained period that increases caloric requirements and aims at maintaining or improving physical fitness, appears promising. We performed both a scoping review and a systematic review on the generic and disease-specific health benefits of aerobic exercise for people with PD. We support this by a meta-analysis of the effects of aerobic exercise on the functional capacity of people with PD.
Benefits

Physical fitness
MDS-UPDRS motor score
Axial motor symptoms
Non-motor symptoms
Health-related quality of life
Disease-modification

Hazards & Threats

Cardiovascular complications
Poor compliance
Falls

Advice to exercise
### Efficacy on outcomes per type of intervention

<table>
<thead>
<tr>
<th>Motor Symptoms</th>
<th>Balance outcomes</th>
<th>Gait outcomes</th>
<th>Quality of Life outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(MDS-) UPDRS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrotherapy</td>
<td>-0.11 [-0.41, 0.19]</td>
<td>0.50 [0.25, 0.75]</td>
<td>0.31 [0.04, 0.59]</td>
</tr>
<tr>
<td>(n=8)</td>
<td>n=5</td>
<td>n=8**</td>
<td>n=7</td>
</tr>
<tr>
<td>Dual task</td>
<td>-0.18 [-0.79, 0.42]</td>
<td>-0.36 [-1.39, 0.66]</td>
<td>-0.25 [-0.85, 0.34]</td>
</tr>
<tr>
<td>(n=3)</td>
<td>n=2</td>
<td>n=1</td>
<td>n=2</td>
</tr>
<tr>
<td>Exergaming</td>
<td>0.58 [0.29, 0.87]</td>
<td>0.47 [0.17, 0.77]</td>
<td>0.23 [-0.20, 0.67]</td>
</tr>
<tr>
<td>(n=9)</td>
<td>n=7**</td>
<td>n=6*</td>
<td>n=3</td>
</tr>
</tbody>
</table>
Research Article

Virtual Reality Telerehabilitation for Postural Instability in Parkinson’s Disease: A Multicenter, Single-Blind, Randomized, Controlled Trial
Enrollment

Assessed for eligibility (n = 135)

Excluded (n = 59)
- (i) Not meeting inclusion criteria (n = 26)
- (ii) Declined to participate (n = 13)
- (iii) Technological issues (n = 20)

Randomized (n = 76)

Allocation

Allocated to TeleWii intervention (n = 38)
- (i) Received allocated intervention (n = 36)
- (ii) Did not receive allocated intervention (n = 2)

Allocated to SIBT (n = 38)
- (i) Received allocated intervention (n = 34)
- (ii) Did not receive allocated intervention (n = 4)

Follow-up

Lost to follow-up (n = 0)
Discontinued intervention (n = 0)

Analysis

Analysed (n = 36)
- (i) Excluded from analysis (n = 0)

Analysed (n = 34)
- (i) Excluded from analysis (n = 0)
Conclusion

A total of 191 trials with 7998 participants were included. Main conclusions:

• Conventional physiotherapy significantly improved motor symptoms, gait, and quality of life.
• Resistance training improved gait.
• Treadmill training improved gait.
• Strategy training improved balance and gait.
• Dance improved motor symptoms, balance and gait.
• Nordic walking improved motor symptoms, balance and gait.
• Balance and gait training improved motor symptoms, balance and gait.
• Martial arts improved motor symptoms, balance, and gait.
• Exergaming improved balance, quality of life and gait.
• Hydrotherapy improved balance.
• Dual task training did not significantly improve any of the outcomes.
How to select a gait intervention?

- Which gait related problem?
- In which context?
- Are there personal factors or preferences?

Evidence
Barriers and Motivators

Barriers and Motivators to Engage in Exercise for Persons with Parkinson’s Disease

Sabine Schootemeijer\textsuperscript{a}, Nicolien M. van der Kolk\textsuperscript{a}, Terry Ellis\textsuperscript{b}, Anat Mirelman\textsuperscript{a, d}, Alice Nieuwhoer\textsuperscript{c}, Freek Nieuwhof\textsuperscript{f}, Michael A. Schwarzchild\textsuperscript{g}, Nienke M. de Vries\textsuperscript{a} and Bastiaan R. Bloem\textsuperscript{a, +}

\textsuperscript{a}Department of Neurology, Radboud University Medical Center, Donders Institute for Brain, Cognition and Behaviour, Center of Expertise for Parkinson & Movement Disorders, Nijmegen, The Netherlands
\textsuperscript{b}Boston University College of Health and Rehabilitation Sciences, Sargent College, Center for Neurorehabilitation, Boston, MA, USA
\textsuperscript{c}Center for the Study of Movement, Cognition, and Mobility, Tel Aviv Sourasky Medical Center, Tel Aviv, Israel
\textsuperscript{d}Sackler Faculty of Medicine and Sagi School of Neuroscience, Tel Aviv University, Tel Aviv, Israel
\textsuperscript{e}Department of Rehabilitation Sciences, Katholieke Universiteit Leuven, Leuven, Belgium
\textsuperscript{f}Radboud University, Donders Institute for Brain, Cognition and Behaviour, Centre for Cognitive Neuroimaging, Nijmegen, The Netherlands
\textsuperscript{g}Department of Neurology, Massachusetts General Hospital, Boston, MA, USA
Barriers and Motivators

- Barriers related to PD
- Ability to integrate exercise in daily life
- Personal factors
- Environmental factors
- Role of medical specialists
Future perspectives
Take home message

- Different types of exercise are effective to improve gait outcomes
- Adapt to personal preferences
- Coach to find ways, materials, places etc
- Follow-up and use remote technology if needed and when possible
- Try to include social support
- Choose something fun!
Thank you!
nienke.devries@radboudumc.nl