Aerobic fitness in people with Parkinson's disease: a review of the evidence
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CRD summary
The review evaluated effects of increased aerobic exercise in patients with Parkinson's disease and found that increased aerobic fitness had predominantly functional benefits for people with mild to moderate Parkinson's disease. The authors made some recommendations for best clinical practice. In view of limitations arising from the review process and the evidence provided, the authors' conclusions may not be reliable.

Authors' objectives
To evaluate the effects of increased aerobic exercise in patients with Parkinson's disease and make recommendations for best clinical practice.

Searching
MEDLINE, EMBASE, The Cochrane Library, AMED, ASSIA, British Nursing Index and Archives, CINAHL, PEDro, ProQuest Medical Library and Science Direct were searched for publications in refereed journals in English. Search dates were not explicitly stated, but the authors reported that there were no temporal constraints. Search terms were reported.

Study selection
Studies that evaluated the effects of increased aerobic fitness of participants diagnosed with Parkinson's disease with no limits on age, duration of disease, stage of disease, medication or previous treatment were eligible for inclusion. The intervention had to include aerobic exercise; studies that included other types of exercise were included if aerobic fitness was the main aim of training. Studies that used multidimensional exercise with no specific focus on aerobic exercise were excluded, as were studies of use of medication with exercise. Studies that used healthy controls were eligible for inclusion.

Relevant outcomes included disease severity, mobility, function, quality of life (QoL) and ability to perform activities of daily living (ADLs). Only studies with a quantitative evaluation of outcome were eligible for inclusion. All participants with Parkinson's disease in included studies were in stages 0-IV according to the Hoehn and Yahr scale for Parkinson's disease. Patients' age range was 47 to 78 years. Only the randomized controlled trials (RCTs) used control groups. Controls maintained normal activity levels or attended interest talks or Qigong classes. Length of interventions ranged from seven weeks to two months. The most common training methods were treadmill training and cycle ergometer (details of exercise regimes were provided). A wide variety of outcome measurements were used.

The authors stated that it was not possible for two reviewers to perform the study selection independently.

Assessment of study quality
The levels of evidence of the American Academy for Cerebral Palsy and Developmental Medicine (AACPDM) were used to classify studies according to design. Only studies of level II (smaller RCTs), level IV (case series, cohort studies without concurrent control groups or case-control studies) and level V (expert opinion, case studies or reports) were identified. Level II studies were further classified as strong, moderate or weak.

The authors did not state how many reviewers performed the validity assessment.

Data extraction
The authors reported the outcomes that were statistically significant with associated p values, but little other detail.

The authors did not report how many reviewers performed the extraction.

Methods of synthesis
A narrative synthesis was provided.
Results of the review

Seven relevant studies were identified (83 patients): three RCTs, one of which was a cross-over trial (62 patients, range 14 to 26; all provided level II evidence, with one strong, one medium and one weak quality RCT); two case series (16 patients, both with eight participants and both level IV studies); and two case reports (5 patients, both provided level V evidence). Two of the RCTs used a follow-up period. None performed a power calculation.

Level II evidence:

The strong-quality cross-over RCT II (11 patients in each group) found significant improvements (p<0.05) with aerobic exercise for the 6-minute walk test, perception of breathlessness, peak oxygen consumption (VO$_{2\text{peak}}$), rate of oxygen consumption/kg and peak double product.

The moderate-quality RCT II (26 patients) also found a significant benefit for aerobic exercise for cardiovascular fitness (p=0.05), functional ability and habitual activity (p=0.003), but this appeared to be associated with a decrease in functional ability in the control group (who attended talks) rather than an increase in the exercise group.

The weak-quality RCT II (4 to 6 patients in each treatment group) had both Parkinson's disease and healthy controls and found significant benefits for aerobic exercise with VO$_{2\text{peak}}$, power and movement initiation in choice conditions. The authors questioned the validity of the assessment of VO$_{2\text{peak}}$ and movement initiation and identified a lack of blinding.

Evidence from level IV and V studies was also presented.

Intensity of intervention: The strong-quality RCT II showed that the minimum number of sessions required for a significant improvement was 21 (50-minute sessions, three times a week for seven weeks). Most other trials used 24 to 36 sessions over 12 weeks.

Authors' conclusions

This review suggested that increased aerobic fitness had a number of benefits for people with Parkinson's disease, which included improvements in disease severity, function, mobility, ability to perform in ADLs and QoL. It was safe to perform, no detriment to neurological status was recorded and it was likely to be a valuable treatment tool of mild to moderate Parkinson's disease.

CRD commentary

The review addressed a well-defined question in terms of participants, interventions and relevant outcomes, but included study designs were broad. Relevant databases were searched, but only for published studies in English. Unpublished studies were not considered and no handsearch was reported, so some relevant studies may have been missed. Publication bias was not assessed. No efforts were made to reduce error and bias in the review process.

Study quality was assessed against suitable criteria. Relevant study details were reported, but no details of loss to follow-up were given. Differences between studies made a narrative synthesis appropriate. The included studies were all very small. In view of the lack of reporting of review methods and very limited evidence from a few small studies, the authors' conclusions may not be reliable.

Implications of the review for practice and research

Practice: The authors stated that people with Parkinson’s disease would benefit from participating in 30 minutes of aerobic activity, including walking and cycling, three times weekly for a minimum of 10 weeks. Activity should include a warm-up and cool down phase of approximately 10 min each to decrease the risk of injury. For patient safety, exercises should begin at a lower intensity of 50-60% HR$_{\text{max}}$ and gradually increase to no more than 85% HR$_{\text{max}}$ to reduce the risk of injury. Classes appeared to be more beneficial than exercise programmes. Socioeconomic factors that needed consideration were location and cost. Motivation was also relevant. Classes should be started as early as possible: at diagnosis or first attendance for physiotherapy.

Research: The authors identified a need for large high-quality RCTs on the effectiveness of aerobic exercise in participants with Parkinson's disease with long-term (more than one year) follow-up. Further investigation of optimal management and specific type, duration and frequency of exercise was required (especially after the initial 10-week
period), as was investigation of contextual factors.

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