

Exercise in MS

- Systematic review found moderate evidence for clinical benefits of exercise in patients with MS¹
 - Treatments included: endurance training, muscle-power training, task-oriented training, mixed programs, yoga
 - **Benefits:** less fatigue, improved mobility, muscle power, exercise tolerance, mood
 - **No adverse effects**
 - Additional studies also found **improved** memory, walking speed, balance, and quality of life²
- Exercise as **disease-modifying therapy?**
 - ↓neural apoptosis and neurodegeneration³
 - ↑cortical thickening in multiple brain regions, relative to both baseline and waitlist controls⁴
 - ↑functional connectivity between brain regions²
 - ↓ markers of BBB permeability (MMP-2, s100b); ↑neurotrophic marker (BDNF, PDGF)²
 - Brain changes significantly correlated with clinical improvements²

BBB, blood-brain barrier; BDNF, brain-derived neurotrophic factor; MMP, matrix metalloproteinase; PDGF, platelet-derived growth factor; s100b, s100 calcium-binding protein B.

1. Amatya B et al. *Cochrane Database Syst Rev*. 2019;1:CD012732; 2. Negaresh R et al. *Eur J Neurol*. 2019;26:711-721;

3. Learmonth YC et al. *Int J Environ Res Public Health*. 2021;18:13245; 4. Kjølhede T et al. *Mult Scler*. 2018;24:1356-1365.

Exercise: Guidelines Recommendations

- Guidelines of the National MS Society
- Neurologists should encourage exercise in all patients with MS
 - Education regarding benefits
 - Refer to specialist as appropriate, to develop safe and effective plan (physical or occupational therapist or exercise or sport scientist), especially for more severe disability

Exercise Recommendations for Mild-to-Moderate MS	
General aerobic	2-3 days/week
Advanced aerobic (eg, running, cycling)	5 days/week
Strength	2-3 days/week
Flexibility	Daily
Balance and agility	3-6 days/week

Exercise Recommendations for Severe MS
Individualized plans
Some level of exercise for all patients

Physical Activity: Guidelines Recommendations

Recommendations for Physical Activity

There is a current shift to emphasizing the inclusion of more physical activity into daily life, in addition to formal exercise

- Recommended for all patients, according to individual abilities
- Rehabilitation specialists useful for developing individualized plans
- Electronic fitness monitors are often motivating aids