

**Table 2.** Exercise recommendations and key messages for EDSS 0–9.0.

EDSS 0–4.5 (mild impairments)	
<p><b>Key messages</b></p> <ul style="list-style-type: none"> <li>• Exercise is beneficial even if a person must do it differently than in the past</li> <li>• Referrals to exercise specialists/programs for individuals with chronic conditions can facilitate participation</li> <li>• Exercise recommendations should be tailored to address a person’s needs/ capacity, as well as personal preferences</li> <li>• Supervised training generally provides better results than non-supervised training</li> <li>• Exercise may temporarily worsen symptoms in patients who are heat-sensitive</li> </ul>	<p><b>Recommended exercise strategies (existing guidelines)</b></p> <ul style="list-style-type: none"> <li>• <b>Aerobic:</b> 2–3x/week; 10–30 minutes at a moderate exercise intensity (40%–60% of maximum HR<sup>a</sup> or aerobic capacity), 11–13 RPE (on a 20-point RPE);<sup>19,20,22</sup> modalities might include arm, leg, or combined cycle ergometry; treadmill or overground walking, rowing, running, or jogging;<sup>23</sup> aquatic activities or upright stepping <ul style="list-style-type: none"> <li>◦ Advanced aerobic strategies: <ul style="list-style-type: none"> <li>■ 5x/week, up to 40 minutes, 70% of peak aerobic capacity or 80% of maximum HR<sup>a</sup>, RPE approaching 15 out of RPE 20 (or 5 out of RPE 10);<sup>19</sup> modalities may include running, road cycling, and pole walking</li> <li>■ HIIT: 1x/week, five 30–90-second intervals at 90%–100% maximum HR, with equivalent rest, to replace a continuous bout of exercise; modalities similar to aerobic<sup>24–26</sup></li> </ul> </li> </ul> </li> <li>• <b>Resistance:</b> 2–3x/week, 1–3 sets for each exercise, 8–15 repetitions/set, 5–10 exercises;<sup>19</sup> modalities might include weight machines, free weights, resistance bands, or body weight exercises</li> <li>• <b>Flexibility:</b> daily, 2–3 sets of each stretch, hold 30–60 sec/stretch; modalities might include yoga and stretching exercises<sup>27</sup></li> <li>• <b>Neuromotor:</b> 3–6x/week, 20–60 minutes, interventions individualized for intensity and duration, targeting fall prevention,<sup>28</sup> postural stability, coordination, and agility at various levels of challenge (seated, standing, walking, upper limb); modalities might include Pilates,<sup>29</sup> dance<sup>30,31</sup> yoga,<sup>32</sup> Tai chi,<sup>33</sup> hippotherapy,<sup>34</sup> virtual reality,<sup>35</sup> and balance and motor control training<sup>36</sup></li> </ul>
EDSS 5.0–6.5 (increasing mobility impairments)	
<p><b>Key messages</b></p> <p>Same as above, plus</p> <ul style="list-style-type: none"> <li>• Exercise is possible for people with increasing disability</li> <li>• When balance is affected, adaptations to the exercise or the environment can reduce the risk of falls</li> <li>• Referrals to specialists are more essential as disability increases, to assure safety, proper form, and appropriate intensity</li> </ul> <p><b>Expert Opinion (in the absence of published data):</b></p> <ul style="list-style-type: none"> <li>• Adaptive exercise may be desirable for some (e.g. recumbent hand-cycle or three-wheel bike for cycling, pole-walking)</li> <li>• With the Borg 10-point scale, intensity would typically be between 2 and 6</li> <li>• <b>Aerobic:</b> heat sensitivity in some patients may require cooling interventions</li> <li>• <b>Resistance:</b> functional/multi-joint movements (sit-to-stand, stair climbing, reaching); neuromuscular electrical stimulation</li> <li>• <b>Neuromotor:</b> good clinical practice incorporates training in posture, coordination, and agility to prevent secondary impairments (i.e. rotator cuff impingement, Trendelenburg gait, low back pain, falls)</li> </ul>	<p><b>Recommended exercise strategies (existing guidelines)</b></p> <p>Same as above</p>
EDSS 7.0–7.5 (diminished ability to perform ADLs—non-ambulatory)	
<p><b>Key messages</b></p> <ul style="list-style-type: none"> <li>• At this level of disability, all recommendations are expert opinion except where noted, due to lack of published evidence</li> <li>• Exercise is beneficial and achievable regardless of a person’s level of disability</li> <li>• Exercise can be independent (e.g. breathing exercises, arm movements) or facilitated by trained assistants (e.g. stretching, range of motion, transfers)</li> <li>• Exercise at this level of disability needs to be guided by a specialist, but may be carried out by trained family or caregivers</li> </ul> <p><b>Expert Opinion:</b></p> <ul style="list-style-type: none"> <li>• At EDSS 7.0–7.5, consider rehabilitation and exercise strategies to remediate deficits in functional mobility: gait training, transfer training, and balance</li> <li>• Caregiver training, especially at higher EDSS scores, is essential</li> <li>• Consider the impact of immobility as well as disease progression on mobility status</li> <li>• Schedule rest breaks to allow for more exercises</li> <li>• Equipment needs are a major focus</li> </ul>	<p><b>Recommended exercise strategies, EDSS 7.0–7.5</b></p> <p>Up to 20 min/day, 3–7 days/week (with each person working to her or his own maximum in order to make gains)—can be accumulated across several shorter sessions, with rest breaks between repetitions and gradual progression in small increments toward the goal:</p> <p><b>Breathing</b></p> <ul style="list-style-type: none"> <li>• Every second day, 3 sets, 10 repetitions/set; resistive breathing apparatus (e.g. spirometer)<sup>38</sup></li> </ul> <p><b>Flexibility</b></p> <ul style="list-style-type: none"> <li>• 1x/day, ≥30–60 seconds, hold/stretch all affected upper and lower extremity joints—combining stretches when possible</li> </ul> <p><b>Upper extremities</b></p> <ul style="list-style-type: none"> <li>• Six 3-minute intervals at 70% target HR, active range of motion with resistance as able (e.g. arm cycling)<sup>39</sup></li> <li>• 3x/week, 3 sets, 10 repetitions/set or 10 sets, 3 repetitions/set, as able, with rests as needed; weights or resistance bands</li> </ul> <p><b>Lower extremities</b></p> <ul style="list-style-type: none"> <li>• Overground walking with walker as able (approximately 10 ft)</li> <li>• 3 sets, 10 repetitions/set of sit-to-stand, reducing assistance and support when possible</li> <li>• 3–5x/week, 30 minutes, power assist cycling<sup>40–42</sup></li> <li>• 3x/week, 30 minutes, standing<sup>43</sup></li> <li>• 2–5x/week, 30–60 minutes, body weight supported treadmill training<sup>44</sup></li> </ul> <p><b>Core</b></p> <ul style="list-style-type: none"> <li>• 2x/day, 4–5 repetitions of seated isometric abdominal muscle strengthening, holding each repetition 10–15 seconds</li> <li>• 3–5 min/day of moving or stationary seated balance, unsupported or supported</li> <li>• Every 1–2 hours, posture exercises (pull shoulder blades back/head up/straighten back), hold for 10–15 seconds</li> </ul>
EDSS 8.0–8.5 (increasing difficulty performing ADLs—confined to wheelchair)	
<p><b>Key messages</b></p> <p>Same as for EDSS 7.0–7.5 plus the following:</p> <ul style="list-style-type: none"> <li>• At EDSS 8.0–8.5, consider strategies that promote quality of life/fitness and reduce morbidity/mortality risks: endurance activities (e.g. arm cycling, lower extremity FES cycling) therapeutic standing, respiratory muscle training</li> </ul> <p><b>Expert Opinion:</b></p> <ul style="list-style-type: none"> <li>• Same as for EDSS 7.0–7.5</li> </ul>	<p><b>Recommended exercise strategies, EDSS 8.0–8.5</b></p> <p>Up to 10–15 min/day, 3–7 days/week <i>with rests between repetitions</i></p> <p><b>Breathing</b></p> <ul style="list-style-type: none"> <li>• Same as 7.0–7.5<sup>38</sup></li> </ul> <p><b>Flexibility</b></p> <ul style="list-style-type: none"> <li>• 1x/day, ≥30–60 seconds, hold/stretch all affected upper and lower extremity joints, with assistance as needed</li> </ul> <p><b>Upper extremities</b></p> <ul style="list-style-type: none"> <li>• Six 3-minute intervals at a target HR (or 70% effort), active range of motion with resistance as able (e.g. arm cycling)<sup>39</sup></li> <li>• 3x/week, 3 sets of 10 repetitions/set or 10 sets of 3 repetitions/set; weights or resistance bands appropriate to ability level</li> </ul> <p><b>Lower extremities</b></p> <ul style="list-style-type: none"> <li>• 2–3x/day, 1–2 minutes of standing with assistance</li> <li>• 3x/week; 30 minutes; standing frame<sup>43</sup></li> </ul> <p><b>Core</b></p> <ul style="list-style-type: none"> <li>• 2x/day, 3–5 repetitions of seated isometric abdominal muscle strengthening, holding each repetition 5–6 seconds</li> <li>• 1–2 min/day of moving or stationary seated balance, unsupported and supported</li> <li>• Every 1–2 hours, posture exercises (pull shoulder blades back/head up/straighten back), hold for 10–15 seconds</li> </ul>
EDSS 9.0 (inability to perform most ADLs—confined to bed or chair)	
<p><b>Key messages</b></p> <p>Same as for EDSS 7.0–7.5 and 8.0–8.5</p> <p><b>Expert Opinion:</b></p> <ul style="list-style-type: none"> <li>• Same as for EDSS 7.0–7.5</li> </ul>	<p><b>Recommended exercise strategies, EDSS 9.0</b></p> <ul style="list-style-type: none"> <li>• Up to 10 min/day, 3–7 days/week as tolerated with rest as needed</li> </ul> <p><b>Breathing</b></p> <ul style="list-style-type: none"> <li>• Same as 7.0–7.5<sup>38</sup></li> </ul> <p><b>Flexibility</b></p> <ul style="list-style-type: none"> <li>• Daily passive ROM of all joints with evidence of restriction</li> <li>• Active ROM as able</li> </ul> <p><b>FES</b></p> <ul style="list-style-type: none"> <li>• For ROM to maintain muscle mass/circulation</li> </ul>

EDSS: Expanded Disability Status Scale; HR: heart rate; RPE: Rating of Perceived Exertion; HIIT: high intensity interval training; ADLs: activities of daily living; ROM: range of motion; FES: functional electrical stimulation.  
<sup>a</sup>220 – age = estimated maximum HR.<sup>37</sup>