

# What is the correct level of claudication pain to prescribe? Universal inconsistency within guidelines, a painful issue

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## Background

Peripheral artery disease (PAD) is an atherosclerotic cardiovascular condition affecting the lower limbs. A classic symptom of PAD is intermittent claudication (IC), which precipitates on exertion and is relieved with rest.<sup>1</sup> Supervised exercise programmes (SEPs) are first line treatments for patients with IC.<sup>2,3</sup> Despite the benefits of exercise, there are inconsistencies between guidelines regarding the recommended level of prescribed claudication pain. The aim of this commentary is to highlight the limitations of current guidance which will lead to variability in care.

The National Institute of Health and Care Excellence (NICE),<sup>4</sup> American Heart Association<sup>5</sup> and British Association of Sport and Exercise Sciences<sup>6</sup> recommend exercising to maximal claudication pain. Supporting this, an early meta-analysis showed walking to near maximal pain to be most beneficial at improving maximal walking and pain-free walking distances. Indicating that greater amounts of ischaemia induced may produce greater haemodynamic and metabolic adaptations.<sup>7</sup> Furthermore, high-intensity walking, eliciting moderate–severe ischaemic leg symptoms, was superior to low-intensity without ischaemic leg symptoms.<sup>8</sup>

Conversely, the American College of Sports Medicine<sup>3</sup> and Exercise and Sports Science Australia<sup>9</sup> suggest moderate pain is most beneficial. A systematic review suggested mild to moderate claudication pain yields optimal results in walking distance and cardiorespiratory fitness when compared to maximal pain.<sup>10</sup> The conclusions were in line with the Vascular Disease Foundation and the American Association of Cardiovascular and Pulmonary Rehabilitation guidelines<sup>11</sup> in that lower limb exercise should be performed to a threshold of mild–moderate pain.<sup>12</sup>

Despite the inconsistencies aforementioned, alarmingly several guidelines do not report a level of claudication pain to work towards,<sup>10</sup> whilst others suggest working at a speed and gradient that induces claudication pain within 3–5 min, without specifying the intensity of the pain.<sup>11</sup> As such, clinicians are not provided with clear guidance. A major

issue is that guidelines are not fully inclusive of the evidence, as they do not consider pain-free exercise. A meta-analysis showed significant improvements in absolute and initial walking distance without inducing claudication pain.<sup>13</sup> A recent systematic review also suggests pain-free SEPs elicit similar improvements in walking performance and functional outcomes compared to moderate pain.<sup>14</sup>

The missed consideration of pain-free SEPs and high claudication pain prescription may lead to poor uptake, as high claudication pain has been commonly cited as a barrier to exercise adherence and uptake of SEPs.<sup>15,16</sup> Indeed patients taking part in a low pain SEP where 1.52 times more likely to complete the SEP than those in the high pain SEP.<sup>16</sup> As SEPs are the first line of treatment for patients with PAD, guidelines must ensure greater participation occurs; consequently, patient ability and preference should be considered, so it is tolerable and beneficial for all patients.<sup>17</sup>

In conclusion, there are inconsistencies regarding the recommended level of claudication pain for clinicians to prescribe. Furthermore, there is no consideration for the evidence base regarding pain-free exercise. It is clear there is a need for a universal set of guidelines that consider optimising patient outcomes as well as uptake and adherence in relation to claudication pain. No research has directly compared maximal, pain-free and moderate claudication pain; however, trials are underway.<sup>18</sup>

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## References

1. Fowkes FG, Rudan D, Rudan I, et al. Comparison of global estimates of prevalence and risk factors for peripheral artery disease in 2000 and 2010: a systematic review and analysis. *Lancet* 2013; 382: 1329–1340. DOI: [10.1016/s0140-6736\(13\)61249-0](https://doi.org/10.1016/s0140-6736(13)61249-0)
2. Lane R, Harwood A, Watson L, et al. Exercise for intermittent claudication. *Cochrane Database Syst Rev* 2017; 12: Cd000990. DOI: [10.1002/14651858.CD000990.pub4](https://doi.org/10.1002/14651858.CD000990.pub4)
3. Riebe D, Ehrman JK, Liguori G, et al. *ACSM's guidelines for exercise testing and prescription/senior editor, Deborah Riebe; associate editors, Jonathan K. Ehrman, Gary Liguori, Meir Magal*. Tenth edition ed. Philadelphia, PA: Wolters Kluwer, 2018.
4. Layden J, Michaels J, Bermingham S, et al. Diagnosis and management of lower limb peripheral arterial disease: summary of NICE guidance. *BMJ* 2012; 345: e4947.
5. Gerhard-Herman MD, Gornik HL, Barrett C, et al. 2016 AHA/ACC guideline on the management of patients with lower extremity peripheral artery disease: executive summary: a report of the American College of Cardiology/American Heart Association task force on clinical practice guidelines. *Circulation* 2017; 135: e686–e725. DOI: [10.1161/CIR.0000000000000470](https://doi.org/10.1161/CIR.0000000000000470)
6. Tew GA, Harwood AE, Ingle L, et al. The bases expert statement on exercise training for people with intermittent claudication due to peripheral arterial disease. *The Sport and Exercise Scientist* 2018 In press.
7. Gardner AW and Poehlman ET. Exercise rehabilitation programs for the treatment of claudication pain. A meta-analysis. *JAMA* 1995; 274: 975–980.
8. McDermott MM, Spring B, Tian L, et al. Effect of low-intensity vs high-intensity home-based walking exercise on walk distance in patients with peripheral artery disease: the lite randomized clinical trial. *JAMA* 2021; 325: 1266–1276. DOI: [10.1001/jama.2021.2536](https://doi.org/10.1001/jama.2021.2536)
9. Askew CD, Parmenter B, Leicht AS, et al. Exercise & Sports Science Australia (ESSA) position statement on exercise prescription for patients with peripheral arterial disease and intermittent claudication. *Journal of Science and Medicine in Sport* 2014; 17: 623–629. DOI: [10.1016/j.jsams.2013.10.251](https://doi.org/10.1016/j.jsams.2013.10.251)
10. Aboyans V, Ricco JB, Bartelink MEL, et al. 2017 ESC Guidelines on the Diagnosis and Treatment of Peripheral Arterial Diseases, in collaboration with the European Society for Vascular Surgery (ESVS): Document covering atherosclerotic disease of extracranial carotid and vertebral, mesenteric, renal, upper and lower extremity arteries Endorsed by: the European Stroke Organization (ESO) the task force for the diagnosis and treatment of peripheral arterial diseases of the European Society of Cardiology (ESC) and of the European Society for Vascular Surgery (ESVS). *Eur Heart J* 2018; 39: 763–816. DOI: [10.1093/eurheartj/ehx095](https://doi.org/10.1093/eurheartj/ehx095)
11. Norgren L, Hiatt WR, Dormandy JA, et al. Inter-society consensus for the management of peripheral arterial disease (TASC II). *J Vasc Surg* 2007; 45: S5–S67. DOI: [10.1016/j.jvs.2006.12.037](https://doi.org/10.1016/j.jvs.2006.12.037)
12. Parmenter BJ, Dieberg G and Smart NA. Exercise training for management of peripheral arterial disease: a systematic review and meta-analysis. *Sports Medicine* 2015; 45: 231–244. DOI: [10.1007/s40279-014-0261-z](https://doi.org/10.1007/s40279-014-0261-z)
13. Parmenter BJ, Raymond J, Dinnen P, et al. A systematic review of randomized controlled trials: walking versus alternative exercise prescription as treatment for intermittent claudication. *Atherosclerosis* 2011; 218: 1–12. DOI: [10.1016/j.atherosclerosis.2011.04.024](https://doi.org/10.1016/j.atherosclerosis.2011.04.024)
14. Seed SA, Harwood AE, Sinclair J, et al. A systematic review of exercise prescription in patients with intermittent claudication: does pain matter? *Ann Vasc Surg* 2021; 77: 315–323. DOI: [10.1016/j.avsg.2021.06.025](https://doi.org/10.1016/j.avsg.2021.06.025)
15. Harwood AE, Smith GE, Cayton T, et al. A systematic review of the uptake and adherence rates to supervised exercise programs in patients with intermittent claudication. *Ann Vasc Surg* 2016; 34: 280–289. DOI: [10.1016/j.avsg.2016.02.009](https://doi.org/10.1016/j.avsg.2016.02.009)
16. Lin E, Nguyen C and Thomas S. Completion and adherence rates to exercise interventions in intermittent claudication: traditional exercise versus alternative exercise – a systematic review. *Eur J Prev Cardiol* 2019; 26: 204748731984699. DOI: [10.1177/2047487319846997](https://doi.org/10.1177/2047487319846997)
17. Harwood AE, Pymmer S, Ingle L, et al. Exercise training for intermittent claudication: a narrative review and summary of guidelines for practitioners. *BMJ Open Sport Exerc Med* 2020; 6: e000897. DOI: [10.1136/bmjsem-2020-000897](https://doi.org/10.1136/bmjsem-2020-000897)
18. Birkett ST, Sinclair J, Seed SA, et al. Effects of exercise prescribed at different levels of claudication pain on walking performance in patients with intermittent claudication: a protocol for a randomised controlled trial. *Ther Adv Cardiovasc Dis* 2022; 16: 17539447221108817. DOI: [10.1177/17539447221108817](https://doi.org/10.1177/17539447221108817)