

1 **Title**

2 Therapeutic exercise relieves pain and does not harm knee cartilage nor trigger inflammation

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33 **Exercise and cartilage health – a common belief and evidence from randomised controlled trials in**
34 **people at risk of, or with knee osteoarthritis**

35 Osteoarthritis (OA) is a leading cause of disability worldwide and associated with pain, impaired
36 mobility and quality of life (1). Physical activity, including therapeutic exercise, patient education and
37 weight control are recommended in key OA treatment guidelines (2). Nevertheless, the belief that
38 therapeutic exercise may harm knee joint cartilage remains common among people with knee OA,
39 and health professionals treating the condition, creating a prevailing barrier to implementing
40 evidence-based care (3-5). The current discord between evidence and persistent beliefs highlights
41 the need for better education. Providing a clear and engaging summary of the evidence to
42 communicate the positive impact of therapeutic exercise and physical activity on the knee joint is
43 crucial to encourage greater acceptance of, and participation in exercise and physical activity to treat
44 knee OA (6). To assist, we summarize in the infographic and this accompanying text and video, two
45 systematic reviews investigating the impact of therapeutic exercise on imaging and molecular
46 biomarkers of articular cartilage, in people at risk of, or with, knee osteoarthritis (7,8). (Figure 1).

47 **Impact of therapeutic exercise on MRI-assessed articular cartilage**

48 The first systematic review included 9 RCTs including 702 people who performed supervised or
49 unsupervised therapeutic exercise, for 12 to 48 weeks, 1 to 5 times a week. The type of exercise
50 used ranged from aquatic therapeutic exercise to activities including jumping. Imaging biomarkers of
51 articular cartilage assessed via Magnetic Resonance Imaging included morphometry (i.e. cartilage
52 thickness and volume), morphology (i.e. cartilage defects) and composition (i.e. glycosaminoglycans
53 and collagen). The results of this systematic review showed that therapeutic exercise did not harm
54 articular cartilage (7).

55 **Impact of therapeutic exercise on molecular biomarkers of cartilage and joint inflammation**

56 The second systematic review included 12 RCTs including 1114 people who performed supervised or
57 unsupervised therapeutic aerobic exercise, strength training or a combination of both. The duration
58 of the exercise interventions ranged from 4 to 24 weeks, with a frequency of 2 to 5 times a week.
59 The molecular biomarkers assessed were related to inflammation (e.g. C-reactive protein and IL-6)
60 and extracellular matrix turnover (e.g. type II collagen carboxy propeptide and cartilage oligomeric
61 matrix protein). The results of this systematic review showed that therapeutic exercise did not
62 trigger inflammatory reactions nor increased the concentration of molecular biomarkers implicated
63 in OA (8).

64 **Clinical implications**

65 People with knee OA must be reassured that therapeutic exercise prescribed to prevent or treat
66 symptomatic knee OA is safe for articular cartilage and if anything, possibly improve cartilage
67 composition. The belief that exercise is harmful for cartilage is based on misinformation. Instead of
68 rest and activity avoidance, people with knee OA should be encouraged, reassured, and supported
69 to engage with exercise and physical activity, which is essential for good joint and general health.
70 Exercise-evoked pain flares are to be expected when new to exercise but patients can be reassured
71 they diminish and usually disappears over the therapeutic exercise period (9). Furthermore, the
72 benefits of physical activity and therapeutic exercise extend well beyond improvements in pain,

73 function and quality of life in people with knee OA (10). Physical activity and exercise is vital to the
 74 prevention of at least 35 chronic diseases, and beneficial in the treatment of 26 (9), many which are
 75 common in people with knee OA. In summary, help spread this knowledge to people with knee OA
 76 by sharing the accompanying infographic and video.

77 **Figure 1 (Infographic)**



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