Information sources and further reading

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Information sheet 1: Osteoarthritis: a global problem

OA IS A LEADING CAUSE OF DISABILITY

United States Bone and Joint Initiative: The Burden of Musculoskeletal Diseases in the United States (BMUS), Fourth Edition, Forthcoming Rosemont, IL. https://www.boneandjointburden.org/fourth-edition/iiib10/osteoarthritis; https://oaaction.unc.edu/policy/cost-of-osteoarthritis/

Worldwide, over 520 million people live with OA

Huibin Long, Qiang Liu, Heyong Yin, Kai Wang, Naicheng Diao, Yuqing Zhang, Jianhao Lin,Ai Guo. Prevalence Trends of Site-Specific Osteoarthritis From 1990 to 2019: Findings From the Global Burden of Disease Study 2019. Arthritis & Rheumatology. Wiley Online Library. First published 1 March 2022

60% of all OA cases are for knee OA

Huibin Long, Qiang Liu, Heyong Yin, Kai Wang, Naicheng Diao, Yuqing Zhang, Jianhao Lin, Ai Guo. Prevalence Trends of Site-Specific Osteoarthritis From 1990 to 2019: Findings From the Global Burden of Disease Study 2019. Arthritis & Rheumatology. Wiley Online Library. First published 1 March 2022

In a global study of 291 conditions, hip and knee OA was ranked as the 11th highest contributor to disability

Cross M, Smith E, Hoy D, Nolte S, Ackerman I, Fransen M, Bridgett L, Williams S, Guillemin F, Hill CL, Laslett LL, Jones G, Cicuttini F, Osborne R, Vos T, Buchbinder R, Woolf A, March L. The global burden of hip and knee osteoarthritis: estimates from the global burden of disease 2010 study. Ann Rheum Dis. 2014 Jul;73(7):1323-30. doi: 10.1136/annrheumdis-2013-204763. Epub 2014 Feb 19. PMID: 24553908.

9.6 million years were lived with disability from OA around the world in 2017

Safiri S, Kolahi A, Smith E, et al. Global, regional and national burden of osteoarthritis 1990-2017: a systematic analysis of the Global Burden of Disease Study 2017. Annals of the Rheumatic Diseases 2020;79:819-828

48% increase in number of people affected globally with OA from 1990 to 2019

David J Hunter, Lyn March, Mabel Chew. Osteoarthritis in 2020 and beyond: a Lancet Commission. The Lancet, Volume 396, Issue 10264, P1711-1712, November 28, 2020

What is osteoarthritis? [Definition]

Patients | Osteoarthritis Research Society International (OARSI)

OA is the most common joint condition. It can affect any moveable joint, most commonly the knees, hips, and hands

Whittaker JL, Runhaar J, Bierma-Zeinstra S, Roos EM. A lifespan approach to osteoarthritis prevention. Osteoarthritis Cartilage. 2021 Dec;29(12):1638-1653. doi: 10.1016/j.joca.2021.06.015. Epub 2021 Sep 21. PMID: 34560260.

OA is characterised by: pain; functional impairments; muscle weakness; joint stiffness; reduced health related quality of life

Whittaker JL, Runhaar J, Bierma-Zeinstra S, Roos EM. A lifespan approach to osteoarthritis prevention. Osteoarthritis Cartilage. 2021 Dec;29(12):1638-1653. doi: 10.1016/j.joca.2021.06.015. Epub 2021 Sep 21. PMID: 34560260.

What causes OA?

The exact cause of OA is still unclear. Risk factors that increase the risk of OA include:

- **having overweight or obesity**
- **having a previous joint injury, joint surgery and/or history of overuse of the joint**
- **your genetics (eg a family history of OA)**

Osteoarthritis - Pain Conditions - painHEALTH (uwa.edu.au)

Whittaker JL, Runhaar J, Bierma-Zeinstra S, Roos EM. A lifespan approach to osteoarthritis prevention. Osteoarthritis Cartilage. 2021 Dec;29(12):1638-1653. doi: 10.1016/j.joca.2021.06.015. Epub 2021 Sep 21. PMID: 34560260.

OA can be clinically diagnosed without investigations if a person:

- **is 45 or over* and**
- **has activity-related joint pain and**
- **has either no morning joint-related stiffness or morning stiffness that lasts no longer than 30 minutes**

*** OA can also be diagnosed in people under the age of 45, commonly after a traumatic joint injury**

National Institute for Health and Care Excellence. Osteoarthritis: care and management: Diagnosis. Last updated: 11 December 2020

Gianotti SM, Marshall SW, Hume PA, Bunt L. Incidence of anterior cruciate ligament injury and other knee ligamentinjuries: a national population-based study. J Sci Med Sport2009;12(6):622e7 [published Online First: 2008/10/07]

Snoeker B, Turkiewicz A, Magnusson K, Frobell R, Yu D, Peat G, et al. Risk of knee osteoarthritis after different types of knee injuries in young adults: a population-based cohort study British Journal of Sports Medicine 2020;54:725-730

How can physiotherapy help OA?

Exercise is the first-line treatment for OA. In addition to helping you choose the best exercises, physiotherapists provide advice and education on pain relief and ways to manage OA. They can teach you how to improve your joint movement and your walking, as well as how to strengthen your muscles.

If you need to have a joint replacement, you are also likely to see a physiotherapist before and after the operation. The physiotherapist will help prepare you to get the maximum benefit from the surgery, and help you recover well after surgery.

Chartered Society of Physiotherapy. Arthritis Arthritis | The Chartered Society of Physiotherapy (csp.org.uk)

Helmark IC, Mikkelsen UR, Børglum J, Rothe A, Petersen MC, Andersen O, Langberg H, Kjaer M. Exercise increases interleukin-10 levels both intraarticularly and peri-synovially in patients with knee osteoarthritis: a randomized controlled trial. Arthritis Res Ther. 2010;12(4):R126. doi: 10.1186/ar3064. Epub 2010 Jul 1. PMID: 20594330; PMCID: PMC2945016.

Runhaar J, Beavers DP, Miller GD, Nicklas BJ, Loeser RF, Bierma-Zeinstra S, Messier SP. Inflammatory cytokines mediate the effects of diet and exercise on pain and function in knee osteoarthritis independent of BMI. Osteoarthritis Cartilage. 2019 Aug;27(8):1118-1123. doi: 10.1016/j.joca.2019.04.009. Epub 2019 Apr 20. PMID: 31009749.

Roos EM, Dahlberg L. Positive effects of moderate exercise on glycosaminoglycan content in knee cartilage: a four-month, randomized, controlled trial in patients at risk of osteoarthritis. Arthritis Rheum. 2005 Nov;52(11):3507-14. doi: 10.1002/art.21415. PMID: 16258919.

Whittaker JL, Runhaar J, Bierma-Zeinstra S, Roos EM. A lifespan approach to osteoarthritis prevention. Osteoarthritis Cartilage. 2021 Dec;29(12):1638-1653. doi: 10.1016/j.joca.2021.06.015. Epub 2021 Sep 21. PMID: 34560260.

National Institute for Health and Care Excellence. Osteoarthritis: care and management. Exercise and manual therapy. Last updated 11 December 2020

Ilana N. Ackerman, Søren T. Skou, Ewa M. Roos, Christian J. Barton, Joanne L. Kemp, Kay M. Crossley, Danny Liew, Zanfina Ademi. Implementing a national first-line management program for moderate-severe knee osteoarthritis in Australia: A budget impact analysis focusing on knee replacement avoidance. Osteoarthritis and Cartilage Open, Volume 2, Issue 3, 2020, 100070, ISSN 2665-9131.

Nicola E. Walsh, Jennifer Pearson, Emma L. Healey, Physiotherapy management of lower limb osteoarthritis. British Medical Bulletin, Volume 122, Issue 1, June 2017, Pages 151–161.

Versus Arthritis. Why is exercise important for people with arthritis?

Information sheet 2: Exercising with osteoarthritis

Exercise first: Exercise and physical activity are safe and evidence-based first line management strategies for osteoarthritis (OA). They can:

- **delay or prevent joint replacement**
- **delay or prevent functional decline**
- **reduce joint pain.**

Helmark IC, Mikkelsen UR, Børglum J, Rothe A, Petersen MC, Andersen O, Langberg H, Kjaer M. Exercise increases interleukin-10 levels both intraarticularly and peri-synovially in patients with knee osteoarthritis: a randomized controlled trial. Arthritis Res Ther. 2010;12(4):R126. doi: 10.1186/ar3064. Epub 2010 Jul 1. PMID: 20594330; PMCID: PMC2945016.

Runhaar J, Beavers DP, Miller GD, Nicklas BJ, Loeser RF, Bierma-Zeinstra S, Messier SP. Inflammatory cytokines mediate the effects of diet and exercise on pain and function in knee osteoarthritis independent of BMI. Osteoarthritis Cartilage. 2019 Aug;27(8):1118-1123. doi: 10.1016/j.joca.2019.04.009. Epub 2019 Apr 20. PMID: 31009749.

Roos EM, Dahlberg L. Positive effects of moderate exercise on glycosaminoglycan content in knee cartilage: a four-month, randomized, controlled trial in patients at risk of osteoarthritis. Arthritis Rheum. 2005 Nov;52(11):3507-14. doi: 10.1002/art.21415. PMID: 16258919.

National Institute for Health and Care Excellence. Osteoarthritis: care and management. Exercise and manual therapy. Last updated 11 December 2020

Bannuru RR, Osani MC, Vaysbrot EE, Arden NK, Bennell K, Bierma-Zeinstra SMA, Kraus VB, Lohmander LS, Abbott JH, Bhandari M, Blanco FJ, Espinosa R, Haugen IK, Lin J, Mandl LA, Moilanen E, Nakamura N, Snyder-Mackler L, Trojian T, Underwood M, McAlindon TE. OARSI guidelines for the non-surgical management of knee, hip, and polyarticular osteoarthritis. Osteoarthritis Cartilage. 2019 Nov;27(11):1578-1589. doi: 10.1016/j.joca.2019.06.011. Epub 2019 Jul 3. PMID: 31278997.

Rausch Osthoff AK, Niedermann K, Braun J, Adams J, Brodin N, Dagfinrud H, Duruoz T, Esbensen BA, Günther KP, Hurkmans E, Juhl CB, Kennedy N, Kiltz U, Knittle K, Nurmohamed M, Pais S, Severijns G, Swinnen TW, Pitsillidou IA, Warburton L, Yankov Z, Vliet Vlieland TPM. 2018 EULAR recommendations for physical activity in people with inflammatory arthritis and osteoarthritis. Ann Rheum Dis. 2018 Sep;77(9):1251-1260. doi: 10.1136/annrheumdis-2018-213585. Epub 2018 Jul 11. PMID: 29997112.

Ilana N. Ackerman, Søren T. Skou, Ewa M. Roos, Christian J. Barton, Joanne L. Kemp, Kay M. Crossley, Danny Liew, Zanfina Ademi. Implementing a national first-line management program for moderate-severe knee osteoarthritis in Australia: A budget impact analysis focusing on knee replacement avoidance. Osteoarthritis and Cartilage Open, Volume 2, Issue 3, 2020, 100070, ISSN 2665-9131.

Wells E, Golightly Y. Exercise in the management of knee and hip osteoarthritis. Curr Opin Rheumatol. 2018 Mar;30(2):151-159. doi: 10.1097/BOR.0000000000000478. PMID: 29251659.

Versus Arthritis. Why is exercise important for people with arthritis?

Can I exercise?

Exercise is appropriate for ALL people with OA, irrespective of age, severity of OA symptoms or level of disability. Exercise programmes can be prescribed and tailored to suit the needs of the individual, to ensure exercise is both achievable and safe.

National Institute for Health and Care Excellence. Osteoarthritis: care and management. Exercise and manual therapy. Last updated 11 December 2020

Ilana N. Ackerman, Søren T. Skou, Ewa M. Roos, Christian J. Barton, Joanne L. Kemp, Kay M. Crossley, Danny Liew, Zanfina Ademi. Implementing a national first-line management program for moderate-severe knee osteoarthritis in Australia: A budget impact analysis focusing on knee replacement avoidance. Osteoarthritis and Cartilage Open, Volume 2, Issue 3, 2020, 100070, ISSN 2665-9131.

Nicola E. Walsh, Jennifer Pearson, Emma L. Healey, Physiotherapy management of lower limb osteoarthritis. British Medical Bulletin, Volume 122, Issue 1, June 2017, Pages 151–161.

How does exercise help?

It can be hard to keep moving when you have arthritis but staying as active as possible can improve pain, reduce other symptoms of OA and help you stay independent. A physiotherapist can help make it easier.

Exercise can:

- **reduce pain**
- **increase your physical function and ability to perform activities that matter to you**
- **improve your muscle strength, which protects and supports your joints**
- **reduce joint stiffness**
- **improve your balance and potentially reduce your risk of falls**
- **improve energy levels and feelings of tiredness**
- **help you maintain a healthy weight, which is important for OA management**
- **boost your mood**
- **increase cardiovascular fitness**
- **help you sleep better**

Your physiotherapist may also recommend mobilisation and stretching, particularly for hip osteoarthritis.

Versus Arthritis. Why is exercise important for people with arthritis?

Versus Arthritis. How can I keep to a health weight? Keeping active

Versus Arthritis. Exercising with arthritis

Arthritis Australia. MyJointPain.org. Exercise

painHealth. Government of Western Australia, Department of Health. Osteoarthritis (OA): Promoting wise healthcare

National Institute for Health and Care Excellence. Osteoarthritis: care and management. Exercise and manual therapy. Last updated 11 December 2020

Exercise is medicine

Regular strengthening exercises and physical activity will help you manage your OA so you can do the everyday things that are important to you.

Research on hip and knee OA shows that compared to no exercise, doing exercise significantly helps reduce pain, more than paracetamol. In this context, exercise is 'medicine'.

painHealth. Government of Western Australia, Department of Health. Movement with pain

Daenen L, Varkey E, Kellmann M, Nijs J. Exercise, not to exercise, or how to exercise in patients with chronic pain? Applying science to practice. Clin J Pain. 2015 Feb;31(2):108-14. doi: 10.1097/AJP.0000000000000099. PMID: 24662498.

Kroll HR. Exercise therapy for chronic pain. Phys Med Rehabil Clin N Am. 2015 May;26(2):263-81. doi: 10.1016/j.pmr.2014.12.007. Epub 2015 Feb 21. PMID: 25952064.

Uthman OA, van der Windt DA, Jordan JL, Dziedzic KS, Healey EL, Peat GM, Foster NE. Exercise for lower limb osteoarthritis: systematic review incorporating trial sequential analysis and network meta-analysis. BMJ. 2013 Sep 20;347:f5555. doi: 10.1136/bmj.f5555. PMID: 24055922; PMCID: PMC3779121.

Wells E, Golightly Y. Exercise in the management of knee and hip osteoarthritis. Curr Opin Rheumatol. 2018 Mar;30(2):151-159. doi: 10.1097/BOR.0000000000000478. PMID: 29251659.

Anthony J Goff, Danilo De Oliveira Silva, Mark Merolli, Emily C Bell, Kay M Crossley, Christian J Barton, Patient education improves pain and function in people with knee osteoarthritis with better effects when combined with exercise therapy: a systematic review. Journal of Physiotherapy, Volume 67, Issue 3, 2021, Pages 177-189, ISSN 1836-9553.

Ilana N. Ackerman, Søren T. Skou, Ewa M. Roos, Christian J. Barton, Joanne L. Kemp, Kay M. Crossley, Danny Liew, Zanfina Ademi. Implementing a national first-line management program for moderate-severe knee osteoarthritis in Australia: A budget impact analysis focusing on knee replacement avoidance. Osteoarthritis and Cartilage Open, Volume 2, Issue 3, 2020, 100070, ISSN 2665-9131.

Nicola E. Walsh, Jennifer Pearson, Emma L. Healey, Physiotherapy management of lower limb osteoarthritis. British Medical Bulletin, Volume 122, Issue 1, June 2017, Pages 151–161.

What exercise should I do?

Exercise should be the core treatment for your OA. It should include:

- **local muscle strengthening**
- **joint motion**
- **normal movement patterns**
- **general physical activity to increase aerobic fitness and minimise sedentary time**

National Institute for Health and Care Excellence. Osteoarthritis: care and management. Exercise and manual therapy. Last updated 11 December 2020

Uthman OA, van der Windt DA, Jordan JL, Dziedzic KS, Healey EL, Peat GM, Foster NE. Exercise for lower limb osteoarthritis: systematic review incorporating trial sequential analysis and network meta-analysis. BMJ. 2013 Sep 20;347:f5555. doi: 10.1136/bmj.f5555. PMID: 24055922; PMCID: PMC3779121

Royal Australian College of General Practitioners. Guideline for the management of knee and hip osteoarthritis. Second edition. 2018

Rausch Osthoff AK, Niedermann K, Braun J, Adams J, Brodin N, Dagfinrud H, Duruoz T, Esbensen BA, Günther KP, Hurkmans E, Juhl CB, Kennedy N, Kiltz U, Knittle K, Nurmohamed M, Pais S, Severijns G, Swinnen TW, Pitsillidou IA, Warburton L, Yankov Z, Vliet Vlieland TPM. 2018 EULAR recommendations for physical activity in people with inflammatory arthritis and osteoarthritis. Ann Rheum Dis. 2018 Sep;77(9):1251-1260. doi: 10.1136/annrheumdis-2018-213585. Epub 2018 Jul 11. PMID: 29997112.

Wells E, Golightly Y. Exercise in the management of knee and hip osteoarthritis. Curr Opin Rheumatol. 2018 Mar;30(2):151-159. doi: 10.1097/BOR.0000000000000478. PMID: 29251659.

Anthony J Goff, Danilo De Oliveira Silva, Mark Merolli, Emily C Bell, Kay M Crossley, Christian J Barton, Patient education improves pain and function in people with knee osteoarthritis with better effects when combined with exercise therapy: a systematic review. Journal of Physiotherapy, Volume 67, Issue 3, 2021, Pages 177-189, ISSN 1836-9553.

Nicola E. Walsh, Jennifer Pearson, Emma L. Healey, Physiotherapy management of lower limb osteoarthritis. British Medical Bulletin, Volume 122, Issue 1, June 2017, Pages 151–161.

Activity pacing: Build slowly and pace yourself so you can reach recommended levels of physical activity.

University of Melbourne, Centre for Health, Exercise and Sports Medicine. PEAK Physiotherapy Exercise and physical Activity for Knee osteoarthritis

Information sheet 3: Preventing osteoarthritis

Osteoarthritis is the most common type of arthritis

Whittaker JL, Runhaar J, Bierma-Zeinstra S, Roos EM. A lifespan approach to osteoarthritis prevention. Osteoarthritis Cartilage. 2021 Dec;29(12):1638-1653. doi: 10.1016/j.joca.2021.06.015. Epub 2021 Sep 21. PMID: 34560260.

Centers for Disease Control and Prevention. Arthritis. Osteoarthritis

Versus Arthritis. Osteoarthritis.

Prevention and early treatment are pivotal to halting the growing burden of osteoarthritis (OA).

In the upcoming decades the world is facing a steep rise in the demand for knee replacement surgery, with some countries forecasting a 900% increase.

Kuijer PPFM, Burdorf A. Prevention at work needed to curb the worldwide strong increase in knee replacement surgery for working-age osteoarthritis patients. Scand J Work Environ Health 2020;46(5):457-460. Published online: 11 Aug 2020, Issue date: 01 Sep 2020.

For some people, OA worsens over time, which is why it is important to get help for your symptoms when they first begin.

Even if you already have OA, there are steps you can take right now to stop it from getting worse and to improve your quality of life and wellbeing.

Whittaker JL, Runhaar J, Bierma-Zeinstra S, Roos EM. A lifespan approach to osteoarthritis prevention. Osteoarthritis Cartilage. 2021 Dec;29(12):1638-1653. doi: 10.1016/j.joca.2021.06.015. Epub 2021 Sep 21. PMID: 34560260.

painHealth. Government of Western Australia, Department of Health. Osteoarthritis

Regular exercise lowers your risk of OA, hip fractures, risk of falls in older adults and can prevent or delay the need for the surgery.

Versus Arthritis. Eating well with arthritis. Keeping active

Versus Arthritis. Exercising with arthritis

Risk factors for osteoarthritis

- **previous joint injury: at any age (including as a child or young adult)**
- **overweight/obesity: puts strain on the joints (particularly the weight-bearing joints such as the hip and knee), and increases joint inflammation**
- **age: your risk of OA increases as you get older**
- **being a woman: OA is more common in women than men**
- **family history: OA may run in families, although studies have not identified a single gene responsible**

The most modifiable risk factors are joint injury and obesity

Whittaker JL, Runhaar J, Bierma-Zeinstra S, Roos EM. A lifespan approach to osteoarthritis prevention. Osteoarthritis Cartilage. 2021 Dec;29(12):1638-1653. doi: 10.1016/j.joca.2021.06.015. Epub 2021 Sep 21. PMID: 34560260

NHS. Osteoarthritis. Causes of arthritis

Joint injury

After joint injury, rehabilitation involving exercise therapy (and patient education) should be the first line of treatment, regardless of whether you need surgery or not.

It is important to return to recommended levels of physical activity and to keep the muscles around the joint strong after an injury.

If you are having a difficult time increasing your physical activity or other physical tasks related to your job or recreation, speak to a physiotherapist about specific exercises to make things easier.

Whittaker JL, Runhaar J, Bierma-Zeinstra S, Roos EM. A lifespan approach to osteoarthritis prevention. Osteoarthritis Cartilage. 2021 Dec;29(12):1638-1653. doi: 10.1016/j.joca.2021.06.015. Epub 2021 Sep 21. PMID: 34560260

Chartered Society of Physiotherapy. Arthritis

Lauersen JB, Bertelsen DM, Andersen LB. The effectiveness of exercise interventions to prevent sports injuries: a systematic review and meta-analysis of randomised controlled trials. British Journal of Sports Medicine 2014;48:871-877

Weight loss

Having overweight or obesity increases your risk of developing OA by placing additional strain on your joints and increasing inflammation in your joints.

If appropriate, losing weight may help lower a person's risk of developing OA and can improve symptoms in people who already have OA.

5kg or 5% weight loss = 90% lower chance to knee complains after 6 years

Whittaker JL, Runhaar J, Bierma-Zeinstra S, Roos EM. A lifespan approach to osteoarthritis prevention. Osteoarthritis Cartilage. 2021 Dec;29(12):1638-1653. doi: 10.1016/j.joca.2021.06.015. Epub 2021 Sep 21. PMID: 34560260

National Institute for Health and Care Excellence. Osteoarthritis: care and management. Weight loss. Last updated 11 December 2020

Versus Arthritis. Eating well with arthritis.

Versus Arthritis. Why is exercise important for people with arthritis? Improving your health.

Preventing joint injuries

Speak to a physiotherapist about building an individualised training programme, this can reduce the risk of knee injuries by up to 50% and may help prevent OA.

If you already do a lot of sport, contact a physiotherapist about advice on how to prevent injury and incorporate appropriate sport-specific strength training

Osteoarthritis Action Alliance. Remain in the Game. Why injury prevention

Osteoarthritis Action Alliance. Injury prevention resources

Information sheet 4: Running and osteoarthritis

Evidence shows that running and other exercise are generally safe for joint cartilage

Some research suggests recreational runners may have a lower occurrence of knee and hip arthritis compared to nonrunners/sedentary people and competitive runners.

The role of running is unclear in OA, particularly competitive running.

Running may protect against future knee replacement surgery

Bricca A, Juhl CB, Steultjens M, Wirth W, Roos EM. Impact of exercise on articular cartilage in people at risk of, or with established, knee osteoarthritis: a systematic review of randomised controlled trials. Br J Sports Med. 2019 Aug;53(15):940-947. doi: 10.1136/bjsports-2017-098661. Epub 2018 Jun 22. PMID: 29934429.

Khan MCM, O'Donovan J, Charlton JM, Roy JS, Hunt MA, Esculier JF. The Influence of Running on Lower Limb Cartilage: A Systematic Review and Meta-analysis. Sports Med. 2022 Jan;52(1):55-74. doi: 10.1007/s40279-021-01533-7. Epub 2021 Sep 3. PMID: 34478109.

Bricca A, Struglics A, Larsson S, Steultjens M, Juhl CB, Roos EM. Impact of Exercise Therapy on Molecular Biomarkers Related to Cartilage and Inflammation in Individuals at Risk of, or With Established, Knee Osteoarthritis: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Arthritis Care Res (Hoboken). 2019 Nov;71(11):1504-1515. doi: 10.1002/acr.23786. PMID: 30320965.

Running and Osteoarthritis: Does Recreational or Competitive Running Increase the Risk? Journal of Orthopaedic & Sports Physical Therapy. Published Online:May 31, 2017. Volume47, Issue6.

E Alentorn-Geli, K Samuelsson, V Musahl, C L Green, M Bhandari, J Karlsson. The Association of Recreational and Competitive Running With Hip and Knee Osteoarthritis: A Systematic Review and Meta-analysis. Journal of Orthopaedic & Sports Physical Therapy. Published Online: May 31, 2017. Volume47, Issue 6.

Helmark IC, Mikkelsen UR, Børglum J, Rothe A, Petersen MC, Andersen O, Langberg H, Kjaer M. Exercise increases interleukin-10 levels both intraarticularly and peri-synovially in patients with knee osteoarthritis: a randomized controlled trial. Arthritis Res Ther. 2010;12(4):R126. doi: 10.1186/ar3064. Epub 2010 Jul 1. PMID: 20594330; PMCID: PMC2945016.

Cartilage generally recovers well from a single running bout and seems to adapt to repeated exposure.

Khan MCM, O'Donovan J, Charlton JM, Roy JS, Hunt MA, Esculier JF. The Influence of Running on Lower Limb Cartilage: A Systematic Review and Meta-analysis. Sports Med. 2022 Jan;52(1):55-74. doi: 10.1007/s40279-021-01533-7. Epub 2021 Sep 3. PMID: 34478109

Resources for how to run safely and prevent injury

Podcast: Brian Cole. Sports Medicine Weekly. How to save your knees without giving up your workout. 13 December 202. [Article also appeared in the New York Times]

Norweigian School of Sport Sciences. Oslo Sports Trauma Research Centre. Fit To Play. Has programmes to prevent injuries for several sports including running.

Information sheet 5: Osteoarthritis: fact or myth?

MYTH: Osteoarthritis (OA) only affects older people

FACT: Although OA is more common as you age, it can and does affect people in their twenties and thirties as well. Up to 50% of youth and young adults will develop OA within 10-15 years of a joint injury. This means they have to live with OA longer, which may result in greater disability, and decrease in quality of life. For this reason young people with a joint injury need to be taught how to reduce their increased risk of OA.

Lohmander, L., et al., High prevalence of knee osteoarthritis, pain, and functional limitations in female soccer players twelve years after anterior cruciate ligament injury. Arthritis & Rheumatism, 2004. 50(10): p. 3145-3152.

Whittaker JL, Runhaar J, Bierma-Zeinstra S, Roos EM. A lifespan approach to osteoarthritis prevention. Osteoarthritis Cartilage. 2021 Dec;29(12):1638-1653. doi: 10.1016/j.joca.2021.06.015. Epub 2021 Sep 21. PMID: 34560260

MYTH: I need an x-ray or MRI to diagnose OA

FACT: There is NOT a strong relationship between OA symptoms (including pain) and the structural joint changes seen on x-rays or MRI scans. In fact, some people's x-rays can show a lot of joint change, but they experience very little pain. This means that relying on information from scans alone can be unhelpful. X-rays, scans or blood tests are only required if the doctor needs to rule out other causes of your joint pain.

University of Melbourne. My Knee Exercise. Understanding knee osteoarthritis.

painHealth. Government of Western Australia, Department of Health. Osteoarthritis

MYTH: More pain = more damage

FACT: Experiencing pain is complex and NOT directly related to the structural changes in your joint. More pain does not mean more structural changes in the joint. Your pain experience is influenced by your emotions, mood, anxiety, stress, poor sleep, fatigue, level of activity, and inflammation at the site.

Fu K, Robbins SR, McDougall JJ. Osteoarthritis: the genesis of pain. Rheumatology (Oxford). 2018 May 1;57(suppl_4):iv43-iv50. doi: 10.1093/rheumatology/kex419. PMID: 29267879.

University of Melbourne. My Knee Exercise. Understanding knee osteoarthritis

painHealth. Government of Western Australia, Department of Health. Osteoarthritis

MYTH: No matter what I do, my OA will only get worse

FACT: There are positive, active things you can do to help with the pain associated with OA, such as walking and strengthening and balance exercise. Only about a third of people get worse over time and some see an improvement in pain and disability. Most people will experience periods when their pain is better or worse, but it doesn't worsen overall. Your physiotherapist will be able to guide you on how to keep active.

Stanton TR, Karran EL, Butler DS, et al. A pain science education and walking program to increase physical activity in people with symptomatic knee osteoarthritis: a feasibility study. Pain Rep. 2020;5(5):e830. Published 2020 Sep 24. doi:10.1097/PR9.0000000000000830

Naugle KM, Ohlman T, Naugle KE, Riley ZA, Keith NR. Physical activity behavior predicts endogenous pain modulation in older adults. Pain. 2017 Mar;158(3):383-390. doi: 10.1097/j.pain.0000000000000769. PMID: 28187102.

Runhaar J, Beavers DP, Miller GD, Nicklas BJ, Loeser RF, Bierma-Zeinstra S, Messier SP. Inflammatory cytokines mediate the effects of diet and exercise on pain and function in knee osteoarthritis independent of BMI. Osteoarthritis Cartilage. 2019 Aug;27(8):1118-1123. doi: 10.1016/j.joca.2019.04.009. Epub 2019 Apr 20. PMID: 31009749.

University of Melbourne. My Knee Exercise. Exercise as treatment.

painHealth. Government of Western Australia, Department of Health. Osteoarthritis

MYTH: Exercise will damage my joint further

FACT: The opposite is true. Exercise and movement are SAFE and the best defence against OA. They act as a joint lubricant and help keep joints healthy. Many people avoid using their painful joints for fear of making it worse. But, when we don't move our joints, they become more stiff and the muscles become weaker. Talk to your physiotherapist about the right exercises for you.

Stanton TR, Karran EL, Butler DS, et al. A pain science education and walking program to increase physical activity in people with symptomatic knee osteoarthritis: a feasibility study. Pain Rep. 2020;5(5):e830. Published 2020 Sep 24. doi:10.1097/PR9.0000000000000830

University of Melbourne. My Knee Exercise. Exercise as treatment.

University of Melbourne. My Knee Exercise. Understanding knee osteoarthritis

Wells E, Golightly Y. Exercise in the management of knee and hip osteoarthritis. Curr Opin Rheumatol. 2018 Mar;30(2):151-159. doi: 10.1097/BOR.0000000000000478. PMID: 29251659.

Anthony J Goff, Danilo De Oliveira Silva, Mark Merolli, Emily C Bell, Kay M Crossley, Christian J Barton, Patient education improves pain and function in people with knee osteoarthritis with better effects when combined with exercise therapy: a systematic review. Journal of Physiotherapy, Volume 67, Issue 3, 2021, Pages 177-189, ISSN 1836-9553.

MYTH: OA is "wear and tear" or "bone on bone"

FACT: OA is NOT caused by the joint "wearing out" over time due to use. OA is a disease that interferes with how the cartilage in our joints repairs itself. OA is not inevitable and not everyone will develop it as they age.

University of Melbourne. My Knee Exercise. Understanding knee osteoarthritis

painHealth. Government of Western Australia, Department of Health. Osteoarthritis

Whittaker JL, Runhaar J, Bierma-Zeinstra S, Roos EM. A lifespan approach to osteoarthritis prevention. Osteoarthritis Cartilage. 2021 Dec;29(12):1638-1653. doi: 10.1016/j.joca.2021.06.015. Epub 2021 Sep 21. PMID: 34560260

Poster 1: Exercising with osteoarthritis

Exercise and physical activity are safe and evidence-based first line management strategies for osteoarthritis. They can:

- **delay or prevent joint replacement**
- **delay or prevent functional decline**
- **reduce joint pain.**

Helmark IC, Mikkelsen UR, Børglum J, Rothe A, Petersen MC, Andersen O, Langberg H, Kjaer M. Exercise increases interleukin-10 levels both intraarticularly and peri-synovially in patients with knee osteoarthritis: a randomized controlled trial. Arthritis Res Ther. 2010;12(4):R126. doi: 10.1186/ar3064. Epub 2010 Jul 1. PMID: 20594330; PMCID: PMC2945016.

Runhaar J, Beavers DP, Miller GD, Nicklas BJ, Loeser RF, Bierma-Zeinstra S, Messier SP. Inflammatory cytokines mediate the effects of diet and exercise on pain and function in knee osteoarthritis independent of BMI. Osteoarthritis Cartilage. 2019 Aug;27(8):1118-1123. doi: 10.1016/j.joca.2019.04.009. Epub 2019 Apr 20. PMID: 31009749.

Roos EM, Dahlberg L. Positive effects of moderate exercise on glycosaminoglycan content in knee cartilage: a four-month, randomized, controlled trial in patients at risk of osteoarthritis. Arthritis Rheum. 2005 Nov;52(11):3507-14. doi: 10.1002/art.21415. PMID: 16258919.

National Institute for Health and Care Excellence. Osteoarthritis: care and management. Exercise and manual therapy. Last updated 11 December 2020

Bannuru RR, Osani MC, Vaysbrot EE, Arden NK, Bennell K, Bierma-Zeinstra SMA, Kraus VB, Lohmander LS, Abbott JH, Bhandari M, Blanco FJ, Espinosa R, Haugen IK, Lin J, Mandl LA, Moilanen E, Nakamura N, Snyder-Mackler L, Trojian T, Underwood M, McAlindon TE. OARSI guidelines for the non-surgical management of knee, hip, and polyarticular osteoarthritis. Osteoarthritis Cartilage. 2019 Nov;27(11):1578-1589. doi: 10.1016/j.joca.2019.06.011. Epub 2019 Jul 3. PMID: 31278997.

Rausch Osthoff AK, Niedermann K, Braun J, Adams J, Brodin N, Dagfinrud H, Duruoz T, Esbensen BA, Günther KP, Hurkmans E, Juhl CB, Kennedy N, Kiltz U, Knittle K, Nurmohamed M, Pais S, Severijns G, Swinnen TW, Pitsillidou IA, Warburton L, Yankov Z, Vliet Vlieland TPM. 2018 EULAR recommendations for physical activity in people with inflammatory arthritis and osteoarthritis. Ann Rheum Dis. 2018 Sep;77(9):1251-1260. doi: 10.1136/annrheumdis-2018-213585. Epub 2018 Jul 11. PMID: 29997112.

Versus Arthritis. Why is exercise important for people with arthritis?

Poster 2: Exercising with osteoarthritis

Can I exercise?

Exercise is appropriate for ALL people with osteoarthritis, irrespective of age, severity of osteoarthritis symptoms or level of disability.

National Institute for Health and Care Excellence. Osteoarthritis: care and management. Exercise and manual therapy. Last updated 11 December 2020

Ilana N. Ackerman, Søren T. Skou, Ewa M. Roos, Christian J. Barton, Joanne L. Kemp, Kay M. Crossley, Danny Liew, Zanfina Ademi. Implementing a national first-line management program for moderate-severe knee osteoarthritis in Australia: A budget impact analysis focusing on knee replacement avoidance. Osteoarthritis and Cartilage Open, Volume 2, Issue 3, 2020, 100070, ISSN 2665-9131.

Nicola E. Walsh, Jennifer Pearson, Emma L. Healey, Physiotherapy management of lower limb osteoarthritis. British Medical Bulletin, Volume 122, Issue 1, June 2017, Pages 151–161.

It should include:

- **local muscle strengthening**
- **joint motion**
- **normal movement patterns**
- **general physical activity to increase aerobic fitness and minimise sedentary time**

National Institute for Health and Care Excellence. Osteoarthritis: care and management. Exercise and manual therapy. Last updated 11 December 2020

Uthman OA, van der Windt DA, Jordan JL, Dziedzic KS, Healey EL, Peat GM, Foster NE. Exercise for lower limb osteoarthritis: systematic review incorporating trial sequential analysis and network meta-analysis. BMJ. 2013 Sep 20;347:f5555. doi: 10.1136/bmj.f5555. PMID: 24055922; PMCID: PMC3779121

Royal Australian College of General Practitioners. Guideline for the management of knee and hip osteoarthritis. Second edition. 2018

Rausch Osthoff AK, Niedermann K, Braun J, Adams J, Brodin N, Dagfinrud H, Duruoz T, Esbensen BA, Günther KP, Hurkmans E, Juhl CB, Kennedy N, Kiltz U, Knittle K, Nurmohamed M, Pais S, Severijns G, Swinnen TW, Pitsillidou IA, Warburton L, Yankov Z, Vliet Vlieland TPM. 2018 EULAR recommendations for physical activity in people with inflammatory arthritis and osteoarthritis. Ann Rheum Dis. 2018 Sep;77(9):1251-1260. doi: 10.1136/annrheumdis-2018-213585. Epub 2018 Jul 11. PMID: 29997112.

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Poster 3: Preventing osteoarthritis

Osteoarthritis is the most common type of arthritis

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Centers for Disease Control and Prevention. Arthritis. Osteoarthritis

Versus Arthritis. Osteoarthritis.

Regular exercise lowers your risk of osteoarthritis, hip fractures, risk of falls in older adults, and can prevent or delay the need for the surgery.

Versus Arthritis. Eating well with arthritis. Keeping active

Versus Arthritis. Exercising with arthritis

Poster 4: Preventing osteoarthritis

Risk factors for osteoarthritis

- **previous joint injury (at any age)**
- **overweight/obesity**
- **age (increases as you get older)**
- **being a woman**
- **family history**

The most modifiable risk factors are joint injury and obesity

Whittaker JL, Runhaar J, Bierma-Zeinstra S, Roos EM. A lifespan approach to osteoarthritis prevention. Osteoarthritis Cartilage. 2021 Dec;29(12):1638-1653. doi: 10.1016/j.joca.2021.06.015. Epub 2021 Sep 21. PMID: 34560260

NHS. Osteoarthritis. Causes of arthritis

Banner 1

Osteoarthritis is the most common type of arthritis

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Versus Arthritis. Eating well with arthritis. Keeping active

Versus Arthritis. Exercising with arthritis

Banner 2

Can I exercise with osteoarthritis?

Exercise is appropriate for ALL people with osteoarthritis, irrespective of age, severity of osteoarthritis symptoms or level of disability.

National Institute for Health and Care Excellence. Osteoarthritis: care and management. Exercise and manual therapy. Last updated 11 December 2020.

Ilana N. Ackerman, Søren T. Skou, Ewa M. Roos, Christian J. Barton, Joanne L. Kemp, Kay M. Crossley, Danny Liew, Zanfina Ademi. Implementing a national first-line management program for moderate-severe knee osteoarthritis in Australia: A budget impact analysis focusing on knee replacement avoidance. Osteoarthritis and Cartilage Open, Volume 2, Issue 3, 2020, 100070, ISSN 2665-9131.

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Additional reading and resources

University of Melbourne, Melbourne School of Health Sciences. Clinician resources: https://healthsciences.unimelb.edu.au/departments/physiotherapy/chesm/clinician-resources

University of Melbourne, Melbourne School of Health Sciences. Physio and patient booklets: https://healthsciences.unimelb.edu.au/departments/physiotherapy/chesm/clinician-resources/peak-translated-resources

Versus Arthritis. Osteoarthritis

painHealth. Government of Western Australia, Department of Health. Osteoarthritis

National Institute for Health and Care Excellence (NICE). Osteoarthritis: care and management

Osteoarthritis Research Society International (OARSI)

GLA:D® International Network

My Knee Exercise

Arthritis Australia: My Joint Pain

Osteoarthritis Action Alliance (OAAA), Thurston Arthritis Research Center (TARC) at the University of North Carolina at Chapel Hill