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Tew, Garry, Ward, Lesley, Hewitt, Catherine Elizabeth et al. (2020) Does Yoga Reduce the Risk of Falls in Older People? BMJ. ISSN: 1756-1833

<https://doi.org/10.1136/bmj.m3246>

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UNCERTAINTIES

Does yoga reduce the risk of falls in older people?

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Cite this as: *BMJ* 2020;370:m3246

<http://dx.doi.org/10.1136/bmj.m3246>

Published: 03 September 2020

What you need to know

- Exercise programmes that involve balance and functional exercises are effective at preventing falls in older people living in the community
- Yoga provides small to moderate improvement in balance and mobility in this population, but there is lack of evidence on effect of yoga on falls
- Health professionals can recommend yoga to older people to promote physical function and mental wellbeing if there are no clinical contraindications, but there is currently insufficient evidence to recommend yoga specifically for preventing falls

Nearly a third of people aged over 65 years and over half of people older than 80 have a fall at least once a year.¹⁻³ Falls and fall related injuries can be life changing and may result in chronic disability, admission to assisted living, or death. A fall can also precipitate a fear of falling, which may lead to restriction of activity and hence physical deconditioning. This in turn increases the risk of future falls.^{4,5}

Clinical guidelines from several countries recommend multifactorial interventions for preventing falls in older people, with exercise as a key component.^{3,6,7} A recent Cochrane review (108 randomised controlled

trials, 23 407 participants) concluded there is strong evidence that well designed exercise programmes reduce the number of falls by about a quarter among older people living in the community.⁸ Such programmes also reduce the number of people experiencing one or more falls. Exercise that mainly involved balance and functional training reduced falls.

Yoga is a mind-body practice that typically involves a combination of physical postures, breathing exercises, and concentration/meditation. Yoga has become a popular means of promoting physical and mental wellbeing⁹ and is shown to improve health related quality of life in older people.¹⁰ Evidence from observational studies suggests it is an acceptable and attractive form of exercise among older people.¹¹⁻¹³ There are many different types of yoga, each of which places varying emphasis on physical, mental, and spiritual practices. In the West, the term “yoga” often denotes a modern form of hatha yoga, consisting largely of postural exercises performed with the goal of developing strength, balance, and flexibility (see fig 1).

Yoga is not recommended specifically in fall prevention guidelines.^{3,6,7} The effect of yoga on falls in community-dwelling older people is uncertain.

This is one of a series of occasional articles that highlight areas of practice where management lacks convincing supporting evidence. The series advisers are Sera Tort, clinical editor, Nai Ming Lai, clinical editor, and David Tovey, editor in chief, the Cochrane Library. You can read more about how to prepare and submit an Education article on our Instructions for Authors pages: <https://www.bmj.com/about-bmj/resources-authors/article-types>



Fig 1 | Examples of yoga postures that are likely to improve balance and strength

What is the evidence of uncertainty?

Search strategy

Identifying evidence on falls

We searched Medline and the Cochrane Library using terms related to yoga and falls. We included systematic reviews and randomised controlled trials (RCTs) that investigated the effect of yoga (any type) on the

incidence of falls or fall related injuries in community-dwelling people aged ≥ 60 years. We did not consider observational studies for this paper.

Identifying evidence on key fall risk factors

We searched our personal archive of references for systematic reviews of RCTs that investigated the effect of yoga on balance, mobility, or lower limb strength in community-dwelling people aged ≥ 60 years.

Identifying ongoing trials

We searched four registries for ongoing RCTs that are investigating the effect of yoga on fall outcomes in community-dwelling people aged ≥ 60 years: Clinicaltrials.gov (<https://clinicaltrials.gov/>); WHO International Clinical Trials Registry Platform (<https://apps.who.int/trialsearch/>); ISRCTN (<https://www.isrctn.com/>); and Australian New Zealand Clinical Trials Registry (<https://www.anzctr.org.au/>).

We did not identify systematic reviews or randomised controlled trials evaluating the effect of yoga on falls or fall related injuries in

community-dwelling older people. Recent Cochrane reviews did not find trials on the effect of yoga on falls either individually or as a component of a multi-factorial programme for fall prevention in older people living in the community.^{8 14 15}

Two systematic reviews have evaluated the impact of yoga on fall risk factors. They find small to moderate improvements with yoga in balance, mobility,^{10 16} and lower limb strength¹⁰ compared with controls. Wide confidence intervals in most of the comparisons limit the robustness of these results. The extent to which such improvements translate to a reduction in falls is not established. Uncertainty remains regarding the optimal components and dose of yoga and the influence of participant characteristics on effect estimates. Few yoga related adverse events such as fall during the yoga session, musculoskeletal pain, and low back pain were noted in the two systematic reviews.^{10 16} Table 1 describes the findings.

Table 1 | Summary of systematic reviews of the impact of yoga on risk factors for falling in older people

Study	Size	Care provided		Key results	Uncertainty
		Intervention	Comparison		
Youkhana et al 2016 ¹⁶ Systematic review of yoga on balance and mobility in people aged ≥60 years	6 RCTs (n=307)	Physical yoga, excluding yoga involving meditation and breathing exercises alone. No limitation placed on type, duration, and frequency of intervention	Defined as no intervention, wait list control, or usual care	<p><i>Balance:</i> Hedges' g=0.40 (small-to-moderate effect), 95% CI 0.15 to 0.65 (6 RCTs, n=307)</p> <p><i>Mobility:</i> Hedges' g=0.50 (moderate effect), 95% CI 0.06 to 0.95 (3 RCTs, n=225)</p> <p><i>Adverse events:</i> 1 RCT reported a fall during a yoga session; 3 RCTs reported minor events, including knee pain, low back pain and muscle strain; 2 RCTs reported no adverse events.</p> <p>Methodological quality of studies was moderate to high (≥6 on 11-point PEDro scale)</p>	Insufficient data to assess the impact of programme and participant characteristics on effect estimates
Sivaramakrishnan et al 2019 ¹⁰ Systematic review of yoga on physical function and HRQoL in people aged ≥60 years	<i>Physical function:</i> 17 RCTs (n=967)	Yoga interventions	Active (e.g. walking) and inactive controls were included. Studies with yoga specified as a control condition or if yoga was combined with other practices or exercise forms were excluded	<p><i>Balance (inactive control):</i> Hedges' g=0.70 (moderate-to-large effect), 95% CI 0.19 to 1.22 (7 RCTs, n=265), P=0.01</p> <p><i>Balance (active control):</i> Hedges' g=0.32 (small-to-moderate effect), 95% CI -0.02 to 0.66 (5 RCTs, n=264), P=0.01</p> <p><i>Mobility (active control):</i> Hedges' g=0.31 (small-to-moderate effect), 95% CI -0.25 to 0.87 (3 RCTs, n=173), P=0.28</p> <p><i>Lower limb strength (inactive control):</i> Hedges' g=0.45 (small-to-moderate effect), 95% CI 0.22 to 0.68 (7 RCTs, n=485), P<0.001</p> <p><i>Lower limb strength (active control):</i> Hedges' g=0.49 (small-to-moderate effect), 95% CI 0.10 to 0.88 (3 RCTs, n=225), P<0.001</p> <p><i>Adverse events:</i> 4 RCTs reported yoga-related adverse events, including groin muscle strain, fall during class, and musculoskeletal pain; 4 RCTs reported no adverse events; 14 RCTs did not report safety data.</p> <p>Relatively few studies were rated as high risk of bias (on Cochrane Risk of Bias tool), but several had unclear risk of bias in the selection and detection bias domains.</p>	Wide 95% confidence intervals for most comparisons make conclusions less compelling

RCT=randomised controlled trial. CI=confidence interval. HRQoL=health-related quality of life.

Is ongoing research likely to provide relevant evidence?

We identified two ongoing trials of yoga in older people. Both studies evaluate the effect of a group-based yoga programme^{17 18} targeting balance, posture, and relaxation, tailored to an older adult population.^{19 20} They are due to complete in 2022, and together will provide evidence regarding the effect of yoga on falls in older people.

The SAGE trial looks at falls incidence over 12 months as the primary outcome.¹⁷ The primary outcome in the Gentle Years Yoga Trial is health-related quality of life, and falls incidence is a secondary outcome alongside other measures of physical and mental wellbeing.¹⁸ Because of the covid-19 pandemic, yoga classes are currently being delivered online via a web-based video conferencing tool. Table 2 provides details of these trials.

Table 2 | Relevant ongoing randomised trials of yoga for people aged 60 years and over

Trial name	Location	Participants	Care provided		Outcomes	
			Intervention	Comparison	Primary	Secondary
SAGE – Successful AGEing yoga trial ⁹	Australia	560 community-dwelling people aged ≥60 years	Group based yoga programme including postures to challenge balance and build leg strength (80 sessions (2 per week over 12 months) + home practice)	Self managed yoga relaxation programme with content that emphasises breathing and relaxation	Falls over 12 months (self reported using monthly falls calendars)	Mental wellbeing, physical activity, HRQoL, self efficacy for activity-specific balance, physical function, pain, sleep quality, healthcare resource use
The Gentle Years Yoga Trial ¹¹	UK	586 community-dwelling people aged ≥65 years with ≥2 chronic conditions	Usual care + group based yoga programme (12 sessions (1 per week over 12-14 weeks) + home practice)	Usual care alone	HRQoL over 12 months (measured with EuroQol 5-dimension 5-level utility score)	Falls (self reported in 3, 6, and 12 month case report forms), depression, anxiety, HRQoL, loneliness, adverse events, healthcare resource use

HRQoL=health related quality of life.

What should we do in the light of the uncertainty?

Routinely ask older patients whether they have had a fall in the past year.³ Note the frequency, context, and characteristics of any falls and observe any balance and gait deficits. In the UK, guidelines from the National Institute for Health and Care Excellence (NICE) recommend multifactorial risk assessment and risk reduction interventions.³ Given the multiple risk factors for falls, these interventions may include balance and strength exercise programmes, home hazard assessment and intervention, vision assessment and referral, and medication review with modification or withdrawal of medicines. Primary care practitioners might initiate elements of this process with support from allied health professionals.

Yoga can be advised in older people for improving physical function and mental wellbeing if there are no clinical contraindications. Given the lack of evidence on falls, yoga is not specifically recommended for falls prevention. Note that not all styles of yoga will be suitable. Older people should find an experienced instructor who can modify the yoga to suit their abilities and needs. This will in turn maximise benefits and safety.

Regular participation in exercise programmes that focus on balance and functional training is advisable for most older people living in the community.²¹ These programmes have been shown to be effective for prevention of falls and non-vertebral fractures in older people.^{3,21} A 2017 systematic review and meta-analysis found that exercise programmes that involve a high challenge to balance and include more than 3 hours per week of exercise have greater fall prevention effects.²²

Recommendations for further research

The lack of evidence regarding the impact of yoga on falls in older people possibly reflects the difficulty of conducting research in this area. Fall prevention research is resource intensive due to the required large sample sizes (generally at least 500 people are needed for sufficient statistical power); monthly, prospective reporting of falls over long periods (usually 12 months); and the nature of the population, where drop out or low intervention adherence due to ill health or other competing demands is not uncommon.

Future studies must explore:

- Optimal type and dose of yoga in older people in terms of fall prevention effectiveness, safety, and cost effectiveness
- The effects of yoga on falls compared with other fall prevention interventions in community-dwelling people aged ≥60 years.

The use of robust RCT designs can address the possible confounding effect of additional physical activities that participants may be undertaking while also doing yoga. Routine measurement of physical activity in future trials is recommended.

What patients need to know

- Around 1 in 3 people over 65 years old who live at home will have at least one fall a year, and about half of these will have more frequent falls.
- Most falls do not result in serious injury, but some can result in a fracture, hospitalisation, or complications such as pain, reduced quality of life, and a loss of self confidence and independence.
- Many falls can be prevented. Ask your doctor about measures to take to reduce your risk of falling. Healthcare professionals can help older people to understand their risk of falling and what they should do if they experience a fall.
- Regular exercise that primarily targets improvement in balance, strength and physical function is effective in reducing falls in older people living in the community.
- We do not know if yoga can prevent falls. Studies involving older people have shown that yoga can improve balance and strength, which are risk factors for falls, but there is insufficient evidence to show that it prevents falls. There are few adverse events with yoga such as fall during a class and musculoskeletal pain.
- Yoga has been shown to promote physical and mental wellbeing in older people. There are many styles of yoga, some of which will be generally more suitable for older people than others. Online class directories can be used to search for local classes. Speak to a yoga teacher about their approach before you sign up for their class.

Additional resources

For the public

- NHS Choices. Falls and falls prevention. www.nhs.uk/conditions/falls/
- NHS Choices. Are you at risk of falling? A simple online test. www.nhs.uk/live-well/healthy-body/are-you-at-risk-of-falling/

- Age UK. The “Staying steady” falls prevention guide. https://www.ageuk.org.uk/globalassets/age-uk/documents/information-guides/ageukig14_staying_steady_inf.pdf
- Saga, Public Health England, Chartered Society of Physiotherapy. The “Get up and go” falls prevention guide. www.csp.org.uk/system/files/get_up_and_go_o.pdf
- NHS Inform. What to do if you fall. www.nhsinform.scot/healthy-living/preventing-falls/dealing-with-a-fall/what-to-do-if-you-fall
- Yoga class finder. <https://www.bwy.org.uk/find-a-yoga-class/>

For healthcare professionals

- National Institute for Health and Care Excellence. Clinical Knowledge Summaries. Falls risk assessment for older people in the community. cks.nice.org.uk/falls-risk-assessment
- National Institute for Health and Care Excellence. Falls in older people (Quality standard QS86). www.nice.org.uk/guidance/qs86
- Centers for Disease Control and Prevention. STEADI initiative – Coordinated guidance on implementing fall prevention strategies in clinical practice. www.cdc.gov/steadi/index.html
- Public Health England. Falls: applying All Our Health. www.gov.uk/government/publications/falls-applying-all-our-health/falls-applying-all-our-health
- Public Health England, National Falls Prevention Coordination Group. Falls and fractures: consensus statement and resources pack. www.gov.uk/government/publications/falls-and-fractures-consensus-statement
- Later Life Training. UK-based provider of falls prevention exercise qualifications. www.laterlifetraining.co.uk/
- National Council on Aging. US directory of evidence-based fall prevention exercise programmes. www.ncoa.org/healthy-aging/falls-prevention/falls-prevention-programs-for-older-adults-2/
- Centre for Ageing Better. Raising the bar on strength and balance: The importance of community-based provision. www.ageing-better.org.uk/publications/raising-bar-strength-balance.

Education into practice

- What information do you offer to older patients on measures they can take to prevent falls and what to do if they have a fall?
- How would you discuss the effects of yoga with an interested older patient?
- What referral pathways to local services do you follow at your practice for risk assessment and modification for preventing falls in older people?

How patients were involved in the creation of this article

A draft of the manuscript was reviewed by a patient and public engagement reviewer. The reviewer commented on the selected age range and outcome measures. Both asked about the role of doctors in promoting yoga, which was subsequently addressed. We are grateful for their input.

Contributors: GAT and LW conducted the searches. GAT led the writing of the first draft of the manuscript with support from the other authors. All authors critically reviewed the manuscript and approved the final version for submission. GAT is the guarantor.

Competing interests: *The BMJ* has judged that there are no disqualifying financial ties to commercial companies. We have read and understood BMJ policy on declaration of interests and declare the following interests: GAT, CH, and LW are investigators in the Gentle Years Yoga Trial, and AT is the chief investigator of the Successful AGEing (SAGE) yoga trial.

Provenance and peer review: Commissioned; externally peer reviewed.

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- 1 Tinetti ME, Speechley M, Ginter SF. Risk factors for falls among elderly persons living in the community. *N Engl J Med* 1988;319:1701-7. doi: 10.1056/NEJM198812293192604 pmid: 3205267
- 2 Bergen G, Stevens MR, Burns ER. Falls and fall injuries among adults aged ≥65 years—United States, 2014. *MMWR Morb Mortal Wkly Rep* 2016;65:993-8. doi: 10.15585/mmwr.mm6537a2 pmid: 27656914
- 3 National Institute for Health and Care Excellence. Falls in older people: assessing risk and prevention (clinical guideline CG161). 2013. www.nice.org.uk/guidance/cg161.
- 4 Yardley L, Smith H. A prospective study of the relationship between feared consequences of falling and avoidance of activity in community-living older people. *Gerontologist* 2002;42:17-23. doi: 10.1093/geront/42.1.17 pmid: 11815695
- 5 Delbaere K, Crombez G, Vanderstraeten G, Willems T, Cambier D. Fear-related avoidance of activities, falls and physical frailty. A prospective community-based cohort study. *Age Ageing* 2004;33:368-73. doi: 10.1093/ageing/afh106 pmid: 15047574
- 6 Panel on Prevention of Falls in Older Persons, American Geriatrics Society and British Geriatrics Society. Summary of the updated American Geriatrics Society/British Geriatrics Society clinical practice guideline for prevention of falls in older persons. *J Am Geriatr Soc* 2011;59:148-57. doi: 10.1111/j.1532-5415.2010.03234.x pmid: 21226685
- 7 Australian Commission on Safety and Quality in Health Care. Preventing falls and harm from falls in older people: Best practice guidelines for Australian community care. 2009. <https://www.safetyandquality.gov.au/sites/default/files/migrated/Guidelines-COMM.pdf>.
- 8 Sherrington C, Fairhall NJ, Wallbank GK, et al. Exercise for preventing falls in older people living in the community. *Cochrane Database Syst Rev* 2019;1. doi: 10.1002/14651858.CD012424.pub2 pmid: 30703272
- 9 Michaelis E. *A history of modern yoga: Patanjali and Western esotericism*. Continuum International Publishing Group, 2005.
- 10 Sivaramakrishnan D, Fitzsimons C, Kelly P, et al. The effects of yoga compared to active and inactive controls on physical function and health related quality of life in older adults: systematic review and meta-analysis of randomised controlled trials. *Int J Behav Nutr Phys Act* 2019;16:33. doi: 10.1186/s12966-019-0789-2 pmid: 30953508
- 11 Tiedemann A, O'Rourke S, Sherrington C. Is a yoga-based program with potential to decrease falls perceived to be acceptable to community-dwelling people older than 60? *Public Health Res Pract* 2018;28. doi: 10.17061/phrp28011801 pmid: 29925087
- 12 Keay L, Praveen D, Salam A, et al. A mixed methods evaluation of yoga as a fall prevention strategy for older people in India. *Pilot Feasibility Stud* 2018;4:74. doi: 10.1186/s40814-018-0264-x pmid: 29736256
- 13 Clarke TC, Barnes PM, Black LI, Stussman BJ, Nahin RL. Use of yoga, meditation, and chiropractors among US adults aged 18 and over. *NCHS Data Brief* 2018;(325):1-8. pmid: 30475686
- 14 Gillespie LD, Robertson MC, Gillespie WJ, et al. Interventions for preventing falls in older people living in the community. *Cochrane Database Syst Rev* 2012;9. doi: 10.1002/14651858.CD007146.pub3 pmid: 22972103
- 15 Hopewell S, Adedire O, Copesey BJ, et al. Multifactorial and multiple component interventions for preventing falls in older people living in the community. *Cochrane Database Syst Rev* 2018;7. doi: 10.1002/14651858.CD012221.pub2 pmid: 30035305
- 16 Youkhana S, Dean CM, Wolff M, Sherrington C, Tiedemann A. Yoga-based exercise improves balance and mobility in people aged 60 and over: a systematic review and meta-analysis. *Age Ageing* 2016;45:21-9. doi: 10.1093/ageing/afv175 pmid: 26707903
- 17 ANZCTR. Successful AGEing (SAGE) yoga trial (ACTRN12619001183178). 2019. <http://anzctr.org.au/Trial/Registration/TrialReview.aspx?id=378039>.
- 18 ISRCTN Registry. The Gentle Years Yoga Trial (ISRCTN13567538). 2019. <http://www.isrctn.com/ISRCTN13567538>.
- 19 Tiedemann A, O'Rourke S, Sesto R, Sherrington C. A 12-week Iyengar yoga program improved balance and mobility in older community-dwelling people: a pilot randomized controlled trial. *J Gerontol A Biol Sci Med Sci* 2013;68:1068-75. doi: 10.1093/geron/glt087 pmid: 23825035
- 20 Tew GA, Howsam J, Hardy M, Bissell L. Adapted yoga to improve physical function and health-related quality of life in physically-inactive older adults: a randomised controlled pilot trial. *BMC Geriatr* 2017;17:131. doi: 10.1186/s12877-017-0520-6 pmid: 28645259
- 21 Public Health England. Falls and fracture consensus statement. 2017. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/586382/falls_and_fractures_consensus_statement.pdf.
- 22 Sherrington C, Michaleff ZA, Fairhall N, et al. Exercise to prevent falls in older adults: an updated systematic review and meta-analysis. *Br J Sports Med* 2017;51:1750-8. doi: 10.1136/bjsports-2016-096547 pmid: 27707740