The effect of fall prevention exercise programmes on fall induced injuries in community dwelling older adults: systematic review and meta-analysis of randomised controlled trials

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STUDY QUESTION

Are fall prevention exercise interventions for older people living in the community effective in preventing different types of fall related injuries?

SUMMARY ANSWER

Exercise programmes designed to prevent falls in older adults seem also to prevent injuries caused by falls, including the most severe injuries. Such programmes also reduce the rate of falls leading to medical care.

WHAT IS KNOWN AND WHAT THIS PAPER ADDS

Well designed exercise programmes can prevent falls in older adults living at home. Evidence that these programmes can also prevent injuries caused by falls is, however, poor. This systematic review of randomised controlled trials examined the effect of fall prevention exercise interventions designed for community dwelling older adults on four different categories of injurious falls, based on severity or medical care. A positive effect of exercise interventions on all four categories was shown.

Selection criteria for studies

To identify relevant studies we searched PubMed, the Cochrane Library, Embase, CINAHL, and the reference lists of studies and relevant reviews from inception to July 2013. We included studies if they were randomised controlled trials of fall prevention exercise interventions, targeting older (>60 years) community dwelling people, and providing quantitative data on injurious falls, serious falls, or fall related fractures. We included studies where exercise was compared with no intervention (usual activity or usual care) or a placebo control intervention not designed to modify the risk of falls (for example, general health education classes).

Rate ratios of injurious falls for fall prevention exercise interventions versus control in community dwelling older adults

Fall categories	No of trials	No of participants	Pooled rate ratio (95% CI)	Heterogeneity	
				I^2 (%)	P value
All injurious falls	10	2922	0.63 (0.51 to 0.77)	50	0.04
Falls resulting in medical care	8	2355	0.70 (0.53 to 0.92)	20	0.27
Falls resulting in serious injuries	7	1750	0.57 (0.36 to 0.90)	46	0.09
Falls resulting in fractures	6	913	0.39 (0.22 to 0.66)	0	0.96

Primary outcomes

No consensus exists about the outcomes of fall related injuries that should be evaluated in controlled trials, and published trials reporting injurious falls used quite different definitions. After reviewing the case definitions in the selected studies, we distinguished four different categories of injurious falls: all injurious falls, falls resulting in medical care, severe injurious falls, and falls resulting in fractures. For each study we extracted or calculated the rate ratio of injurious falls. Depending on the available data, a given study could contribute data relevant to one or more categories of injurious falls. We estimated a pooled rate ratio for each category of injurious falls based on random effects models.

Main results and role of chance

17 trials involving 4305 participants were eligible for meta-analysis. Exercise had a significant effect in all categories of injurious falls, with pooled estimates of the rate ratios for each category of 0.63 (95% confidence interval 0.51 to 0.77, 10 trials) for all injurious falls, 0.70 (0.53 to 0.92, eight trials) for falls resulting in medical care, 0.57 (0.36 to 0.90, seven trials) for severe injurious falls, and 0.39 (0.22 to 0.66, six trials) for falls resulting in fractures. Results of sensitivity analyses excluding trials judged to be at higher risk of bias in all four categories of injurious falls barely changed the pooled effect estimates. All tested interventions included a balance training component, which has been found to be a key factor in determining the effectiveness of exercise for all falls. In subgroup analyses of all injurious falls and those resulting in medical care, exercise seemed effective whether or not participants had been selected based on a higher falls risk at inclusion, and there was no evidence of a difference in exercise effect by intensity of the balance training component.

Bias, confounding, and other reasons for caution

Significant heterogeneity was observed between the studies of all injurious falls (I^2=50%, P=0.04), which indicates the possibility of meaningful differences between the studies and calls for caution in interpretation and generalisation of the results.

Study funding/potential competing interests

This research received no specific funding. We have no competing interests.

Psychiatry updates from *BMJ* http://www.bmj.com/specialties/psychiatry

Clinical effectiveness of a manual based coping strategy programme (START, STrAtegies for RelaTives) in promoting the mental health of carers of family members with dementia: pragmatic randomised controlled trial

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STUDY QUESTION

Does an eight session manual based coping intervention reduce depression and anxiety symptoms in carers of family members with dementia compared with treatment as usual over an eight month evaluation period?

SUMMARY ANSWER

The intervention group had significantly fewer symptoms of depression and anxiety than the treatment as usual group at follow-up.

WHAT IS KNOWN AND WHAT THIS PAPER ADDS

About 40% of carers of family members with dementia have clinical depression or anxiety and others have significant psychological symptoms. The START (STrAtegies for RelaTives) intervention, delivered by graduate psychologists without clinical training, was effective in reducing affective symptoms and increasing quality of life of the carers.

Design

Online computer generated randomisation, stratified by trust, using random permuted blocks; parallel group, superiority trial with blinded outcome assessment using repeated measures adjusted for baseline variables.

Participants and setting

260 carers of family members with dementia referred over the preceding year to three mental health and one neurological outpatient dementia service in London and Essex, United Kingdom.

Primary outcome

Affective symptoms (total score on the hospital anxiety and depression scale, which ranges from 0-42, with higher scores indicating more symptoms) at four and eight months.

Main results and the role of chance

173 were randomised to the intervention and 87 to treatment as usual. Mean total scores on the hospital anxiety and depression scale, adjusted for baseline scores, were lower in the intervention group than in the treatment as usual group at follow-up: adjusted difference in means −1.80 points (95% confidence interval −3.29 to −0.31; P=0.02) and absolute difference in means −2.0 points. Carers in the intervention group were less likely to have case level depression (odds ratio 0.24, 95% confidence interval 0.07 to 0.76) and there was a non-significant trend towards reduced case level anxiety (0.30, 0.08 to 1.05). Carers' quality of life was higher in the intervention group (difference in means 4.09, 95% confidence interval 0.34 to 7.83) but not the recipients of care (0.59, −0.72 to 1.89).

Bias, confounding, and other reasons for caution

We informed the clinical teams if carers reported abusive behaviour and thus may have improved the outcome for the treatment as usual group. Although randomisation was independent and researchers blinded to follow-up, the carers inevitably knew group allocation.

Generalisability to other populations

These findings are generalisable to carers of family members with dementia referred from primary care, as carers varied in age, education, ethnicity, and relationship to the recipient of the care; and came from psychiatry and neurology clinics and from rural, urban, and suburban settings. The levels of anxiety and depressive symptoms and case level anxiety and depression, were slightly higher than in a recent cohort study of newly referred people with dementia, so those with more problems may have been more likely to participate.

Primary and secondary outcomes at follow-up for carers in intervention and treatment as usual groups. Values are means (standard deviations) unless otherwise stated

Outcomes	Treatment as usual group		Intervention group		Adjusted treatment effect* (95% CI)
	4 months	8 months	4 months	8 months	
HADS total score	14.3 (7.4) (n=75)	14.9 (8.0) (n=71)	12.4 (7.4) (n=150)	12.9 (7.9) (n=133)	−1.80 (−3.29 to −0.31), P=0.02 (n=220)
Quality of life-Alzheimer's disease	29.8 (5.8) (n=66)	29.7 (6.3) (n=61)	30.7 (6.5) (n=137)	30.3 (7.3) (n=120)	0.59 (−0.72 to 1.89) (n=197)
Health status questionnaire (mental health)	58.4 (18.0) (n=72)	58.2 (19.2) (n=66)	62.7 (20.8) (n=144)	58.6 (22.0) (n=122)	4.09 (0.34 to 7.83) (n=211)
HADS:					
Anxiety	8.6 (4.2) (n=75)	8.8 (4.4) (n=71)	7.5 (4.2) (n=150)	7.6 (4.4) (n=133)	−0.91 (−1.76 to−0.07) (n=220)
Depression	5.7 (4.0) (n=75)	6.1 (4.2) (n=71)	4.9 (3.9) (n=150)	5.2 (4.0) (n=133)	−0.91 (−1.71 to−0.10) (n=220)
Anxiety case (No (%) scoring ≥9)	36 (48) (n=75)	33 (46) (n=71)	54 (36) (n=150)	53 (40) (n=133)	0.30† (0.08 to 1.05) (n=220)
Depression case (No (%) scoring ≥9)	18 (24) (n=75)	23 (32) (n=71)	25 (17) (n=150)	28 (21) (n=133)	0.24† (0.07 to 0.76) (n=220)

Treatment effect estimates (differences and odds ratios) are from models taking into account repeated measurements and therapist clustering in intervention arm and that are adjusted for baseline characteristics. HADS=hospital anxiety and depression scale. *Adjusted for baseline score, centre, carers' age, sex, neuropsychiatric inventory score, and Zarit burden interview. †Odds ratio.

Psychiatry updates from *BMJ* http://www.bmj.com/specialties/psychiatry

Cost effectiveness of a manual based coping strategy programme in promoting the mental health of family carers of people with dementia (the START (STrAtegies for RelaTives) study): a pragmatic randomised controlled trial

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STUDY QUESTION

Is START (STrAtegies for RelaTives)—an eight session, manual based coping intervention for family carers of people with dementia—cost effective compared with treatment as usual from a health and social care perspective over an 8 month evaluation period?

SUMMARY ANSWER

START, when added to treatment as usual, was cost effective compared with usual treatment alone by reference to both the primary outcome (affective symptoms for family carers) and carer based quality adjusted life years (QALYs).

WHAT IS KNOWN AND WHAT THIS PAPER ADDS

Family carers are the mainstay of dementia care, but there is little evidence on interventions to support carers that have been shown to be cost effective. In terms of health and social care services used by carers, the START intervention is not more expensive than usual care and is cost effective by reference to reductions in carers' affective symptoms and improvements in carers' health-related quality of life.

Design

Online computer generated randomisation, stratified by trust, using random permuted blocks; parallel group, superiority trial with blinded outcome assessment using repeated measures adjusted for baseline variables.

Participants and setting

We recruited 260 family carers of people with dementia referred over the preceding year to three mental health and one neurological outpatient dementia service in London and Essex, UK.

Primary outcome(s)

Affective symptoms (Hospital Anxiety and Depression Scale total (HADS-T), which ranges from 0 to 42 with higher scores indicating more symptoms), quality adjusted life years (QALYs), costs, and cost effectiveness over eight months.

Main results and the role of chance

Of the 260 participants, 173 were randomised to START in addition to treatment as usual and 87 to usual treatment alone. Mean HADS-T scores, adjusted for baseline scores, were lower in the intervention group than usual treatment group at eight months (mean difference −1.79 (95% confidence interval −3.32 to −0.33)), indicating better outcomes with START. There was a small improvement in health-related QALY (mean difference 0.03 (−0.01 to 0.08)). Costs were not significantly different between the intervention and usual treatment groups (£252 higher (95% CI −28 to 565) for START group). Cost effectiveness calculations suggested that START had a >99% chance of being seen as cost effective compared with usual treatment alone at a willingness-to-pay threshold of £30 000 per QALY gained, and a high probability of cost effectiveness on the HADS-T measure (table).

Differences between START intervention and usual treatment groups in treatment and cost impacts and cost effectiveness

Effect	Mean difference (95% CI) and ICER
With QALY as outcome (n=177*)	
Incremental health and social care costs (£†)	252 (−28 to 565)
Incremental QALY gain	0.042 (0.015 to 0.071)
ICER (£ per QALY)	6000
With HADS-T as outcome (n=191‡)	
Incremental health and social care costs (£†)	247 (0 to 569)
Incremental HADS-T change	2.10 (0.51 to 3.75)
ICER (£ per unit change on HADS-T)	118

ICER=Incremental cost effectiveness ratio. QALY=quality adjusted life year. HADS-T=Hospital Anxiety and Depression Scale total score.
*Sample size based on complete data for QALY and cost measures.
†Costs at 2009-10 prices.
‡Sample size based on complete data for HADS-T and cost measures.

Bias, confounding, and other reasons for caution

We informed clinical teams if carers reported abusive behaviour, which may have improved outcome for usual treatment. Randomisation was independent, and researchers were blinded to follow-up, but family carers inevitably knew their group allocation.

Generalisability to other populations

Findings are generalisable to family carers of people with dementia referred from primary care, as participants varied in age, education, ethnicity, and relationship to the patient, and were recruited from a range of settings. Carers with more anxiety and depressive symptoms may have been more likely to participate.

Study funding/competing interests

This project was funded by the National Institute for Health Research Health Technology Assessment (NIHR HTA) Programme (project No 08/14/06).

Trial registration number

ISRCTN70017938

The relation between total joint arthroplasty and risk for serious cardiovascular events in patients with moderate-severe osteoarthritis: propensity score matched landmark analysis

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STUDY QUESTION

What are the rates of serious cardiovascular events in those who undergo primary total joint arthroplasty (TJA) compared with those who do not within three years of initial assessment?

SUMMARY ANSWER

Undergoing elective primary TJA within three years of initial assessment was associated with a significant 12.4% absolute reduction in subsequent risk of serious cardiovascular events.

WHAT IS KNOWN AND WHAT THIS PAPER ADDS

Osteoarthritis is associated with increased mortality, particularly secondary to cardiovascular disease, with the risk for mortality proportional to the degree of disability secondary to the arthritis. This study suggests that management of hip or knee osteoarthritis with arthroplasty decreases the risk for subsequent serious cardiovascular events.

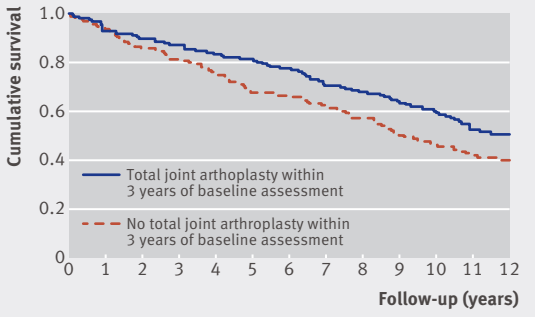
Participants and setting

We utilised baseline questionnaire data from the Ontario Hip/Knee Study (1996-98), a population based cohort of 2411 adults aged 55 or more with disabling hip or knee arthritis and living in Ontario, Canada. 153 participants (88.4%) who underwent a primary, elective TJA during the exposure period were matched to a participant who did not.

Design, size, and duration

We carried out a propensity score matched landmark analysis. Entry to the cohort occurred on completion of the baseline questionnaire. We chose a landmark date of three years after completion of the questionnaire. Those who experienced a primary elective TJA during this period were considered exposed and those who did not were considered unexposed (regardless of whether they underwent TJA after the landmark date). We excluded participants who had a cardiovascular event or died during the exposure period. A propensity score for undergoing a TJA within the exposure period was determined from information on sociodemographics (age, sex, body mass index, education, income), health status (comorbidities, SF-36 general health score, pre-existing cardiovascular disease, depression, smoking status, use of non-steroidal anti-inflammatory drugs), and arthritis severity (Western Ontario and McMaster Universities arthritis index, trouble-some hips and knees). We matched exposed to unexposed participants in a ratio of 1 to 1.

Survival probability for matched groups



Main results and the role of chance

111 (36.3%) cardiovascular events occurred in our matched cohort (153 pairs) over a median follow-up period of seven years. The TJA group were less likely to experience a cardiovascular event during follow-up (hazard ratio 0.56, P<0.001). The absolute risk reduction was 12.4% and the number needed to treat was eight.

Bias, confounding, and other reasons for caution

A theoretical unmeasured confounder, if not collinear with other covariates, would have to have had a prevalence of at least 75% in one group, and be completely absent from the other group, with a relative risk ratio of at least 0.65 (if found only among the TJA group) or 1.50 (if found only among the non-TJA group) to account for the observed TJA effect. Potential unmeasured confounders included motivation, self efficacy, hyperlipidaemia, and renal insufficiency.

Generalisability to other populations

This study used a true population based cohort of people with osteoarthritis. Further study is required to confirm our results.

Study funding/potential competing interests

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