

'Wellness' interventions

Background

Wellness is more than just an absence of illness and a feeling of wellness must include having a positive view of your own health and health related quality of life. Interventions designated as 'Wellness' programmes or interventions may address causes of sickness or absenteeism in the workplace or issues of lifestyle more generally but wellness interventions in the broader sense include all interventions that help prevent future adverse health events and conditions irrespective of whether that is through lifestyle guidance or preventive medical intervention.

The prevention of future adverse health events and conditions is a very broad subject and individual topics, such as the prevention of falls in older adults, would each merit a full review in themselves. This rapid review can only skim the surface of these broader, public health related, wellness interventions.

Summary and key findings

Workplace based wellness programmes are, in general, effective in improving employee lifestyle choices, absenteeism, staff turnover, accidents and injuries, employee satisfaction, output and productivity, and staff health and welfare as well as being cost-effective overall.

Increasing physically activity, in general, improves both health and mortality, including from cardiovascular disease, with the greatest effects being in changes from no to low levels of physical activity. Results of the effectiveness of increased physical activity on mental health are however mixed. Interventions to increase walking are the easiest to achieve and can be readily incorporated into daily life. Walking speed rather than time is more influential in achieving health objectives. Interventions to increase walking are usually aimed at the individual whereas interventions to increase cycling are, in general, aimed at the cycling environment. Swimming however may be more effective than walking as a source of physical activity.

Dancing has been shown to be an effective intervention as it combines both physical and social activity and group singing has been shown to improve the hedonic, eudaimonic and social domains of well-being. Alternative group therapies, such as Tai Chi and Yoga, can improve balance and reduce falls.

Lifestyle interventions are important in improving health. Smoking cessation campaigns are particularly effective if targeted at the point of retirement. Interventions to improve diet have had little effect but, as with physical activity, interventions for diet are most effective with individuals who consider themselves more at risk, perhaps because of a pre-existing health condition.

Women in particular benefit from increased levels of leisure and social activity and volunteering overall has a positive effect on health outcomes, particularly if that volunteering is appreciated.

Medical interventions vary in their effectiveness. Screening programmes for colorectal, cervical and breast cancer, as well as for abdominal aortic aneurism, have been shown to be effective but prostate cancer screening is more problematic. The effectiveness of aspirin as a prophylactic in reducing future levels of vascular disease and all-cause mortality has been well demonstrated although the effectiveness of statins is still subject to dispute. Doctors are more likely to prescribe preventive medication than to take it themselves.

Vaccination programs against pneumonia and influenza have been shown to be effective but prioritising health workers and children, thereby engendering herd immunity, may be the most effective strategy.

Review of evidence

	Page
a) Reviews and overviews	4
b) ‘Wellness’ interventions – workplace and other interventions designated as ‘wellness interventions’	6
c) Alternative group therapies - Tai Chi and Yoga	20
d) Arts and music – dancing and singing	24
e) Falls prevention	27
f) Lifestyle interventions – diet and nutrition, smoking cessation, motivation, leisure, life-long learning and volunteering	31
g) Medical interventions – preventive medication, immunisation and screening	41
h) Physical activity – walking, cycling and swimming	54
i) Technology	74

The reviewed evidence is listed in reverse chronological order with the most recent evidence first.

a) Reviews and overviews

Study	Findings
<p>Howse K and Prophet H; Centre for Policy on Ageing - CPA (2000) <i>Improving the health of older Londoners - reviewing the evidence</i>, London: Centre for Policy on Ageing</p>	<p>The London Regional Office of the NHS Executive commissioned the Centre for Policy on Ageing (CPA) to produce this review to contribute to the development of London's health strategy. The authors review evidence on the effectiveness of different interventions aimed at preventing or postponing ill-health and disability in later life. Nearly all the evaluation studies cited are randomised controlled trials (RCTs).</p> <p>Conclusions:</p> <p>The best evidence of effectiveness (what works) is available for a handful of interventions which have been evaluated in several clinical trials and have been the subject of meta-analyses or systematic reviews.</p> <p>Influenza vaccination works: during influenza epidemics it reduces mortality, morbidity and hospitalisation among people aged 65 years or more.</p> <p>Anti-hypertensive medication works in older people: it has been shown to have measurable survival benefits in people up to about 80 years of age.</p> <p>Multi-factorial behavioural interventions (with or without pharmacological treatment) to reduce cardiovascular risk work better in high risk populations than in the general population: they reduce cardiac deaths (although not much of this evidence comes from research which has been conducted specifically with older people).</p> <p>Cardiac rehabilitation works: it has measurable survival and quality of life benefits (though once again the evidence is limited in respect of older cardiac patients).</p> <p>Multi-disciplinary assessment for falls prevention with appropriate follow-up works: it prevents falls and fall-related injuries in high-risk populations of older people living in the community (e.g. those who have already fallen).</p> <p>There is also some evidence from randomised controlled trials for the effectiveness of educational/behavioural interventions targeting older people.</p> <p>Educational/behavioural interventions can be effective in reducing CVD risk behaviours among unselected populations of older people. There is some evidence for the effectiveness of various approaches to encouraging increased levels of physical activity among older people.</p> <p>Individually tailored health promotion interventions — targeted towards older people with chronic health problems or disability and focussed on behaviour change/self-management of disease — can add life to years.</p> <p>There is limited evidence that social interventions are productive of health benefits.</p>

<p>PricewaterhouseCoopers LLP (2008) <i>Building the case for wellness</i> (A report prepared for the Department for Work and Pensions)</p>	<p>After identifying key programme costs and perceived or realised benefits, 7 case studies reviewed report a return on investment, in terms of a benefit-cost ratio (BCR), for their wellness programmes. This ratio highlights the nominal return for every unit of cost expenditure (i.e. 4.17 illustrates that for every £1 spent the organisation recovered £4.17 in programme benefits).</p> <p>The systematic reviews considered provide the following benefit-cost ratios: Programmes targeting medical costs alone found a return on investment of 2.3 Programmes targeting absenteeism found returns on investment of 2.5, 4.9 and 10.1. Programmes targeting absenteeism and presenteeism found returns on investment of 1.81, 3.24 and 8.81. The benefit-cost ratio for programmes targeting musculoskeletal issues were as high as 15.4, 24.6 and 84.9</p> <p>Results from UK case studies:</p> <p>Absenteeism: 45 out of 55 cases reported a reduction in days lost through sickness absence as a consequence of wellness interventions. The reductions in lost days vary enormously, ranging from 10% to 97% over the evaluation period, with the reported average around 30-40%.</p> <p>Staff turnover: 18 cases mention a positive impact on reduction in staff turnover, through improved staff retention and/or return to work rates. Reductions in staff turnover rates range from about 10% to 25%. On average, the reduction in staff turnover was around 20-25%.</p> <p>Accidents and injuries: 16 cases reported reductions in accidents and injury rates as a consequence of worksite wellness initiatives. Reductions ranged from 30% to 73%, with the average reduction around 50%. 7 cases cite reduced insurance or civil claims, and/or savings on insurance premiums.</p> <p>Employee satisfaction: 14 cases mention a positive impact on employee satisfaction as a result of wellness programme intervention and participation. For example, one organisation saw a dramatic and positive increase in employees' opinion of the organisation from -0.08 in 2003 to +0.53 in 2006 (range is -2 to +2).</p> <p>Resource allocation: 9 cases cite a reduction in time dedicated to managing sickness absence, employee disciplinary procedures or injury investigation as a consequence of wellness interventions.</p> <p>Company profile: 8 cases report an improvement in their external reputation, which can help attract and retain quality staff and raise public profile.</p> <p>Output and productivity: 8 cases attributed improvements in productivity levels to implementing wellness programmes, some referring to reduced errors or rejects and increased utilisation rates. A further 4 cases attribute increased competitiveness and profitability to wellness programmes. For example, the increase in productivity at one manufacturing organisation was partly responsible for the working week falling from 48 to 40 hours, coupled with a significant reduction in stock levels.</p> <p>Health and welfare: 8 cases explicitly mention an improvement in the health and welfare of their employees associated with their wellness initiatives, including improved diet, exercise and general wellbeing. One case reports a 33% success rate from its smoking cessation programme; another tracked reductions in employee fatigue through a personal resilience evaluation.</p>
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b) ‘Wellness’ interventions – workplace and other interventions designated as ‘wellness interventions’

Study	Methods	Findings
<p>Braun L, Stanguts C, Spitzer O, Hose L, Gunawan M, Kure C E, Kwa L, Esmore D, Bailey M and Rosenfeldt F (2014) A wellness program for cardiac surgery improves clinical outcomes, <i>Advances in Integrative Medicine</i> 1 (1) : 32-37</p>	<p>Objective: To evaluate the efficacy of an Integrative Cardiac Wellness Program (ICWP) for cardiothoracic surgery patients on postoperative recovery, bleeding risk, satisfaction and participation in rehabilitation programs.</p> <p>Design: An open label study whereby ICWP participants were compared to a historical control group that received usual care at the same hospital.</p> <p>Methods: Patients enrolled at pre-admission clinics took metabolic supplements (CoQ10, magnesium orotate, alpha lipoic acid, omega 3 fatty acids) three times daily from enrolment until surgery and for 4 weeks afterwards. Between postoperative days 3–7, patients received individualised health education from a naturopath followed by a phone call post-discharge. The control group consisted of elective cardiothoracic patients receiving usual care prior to the ICWP commencing. Data was collected from medical records, a survey and interviews.</p> <p>Data from 922 patients were analysed. ICWP participants (n = 337) were well matched with controls (n = 585) for age, gender and history of hypertension, hypercholesterolaemia, diabetes and smoking.</p>	<p>Multivariate analysis found that CABG ICWP patients had a relative reduction of 42% for postoperative inotrope (cardiac stimulants) support compared to controls (p < 0.001). Similarly, the ICWP valve surgery patients had 40% relative reduction in the incidence of postoperative inotrope support compared to controls (p = 0.02).</p> <p>There was no significant difference between the treatment and control groups in the incidence of serious bleeding events, defined as return to theatre due to haemorrhage or blood transfusion requirements.</p> <p>ICWP patients gave positive feedback of their experience and there was a 46% increase in attendance at rehabilitation programs compared to controls (p = 0.033).</p>

<p>Green B B, Anderson M L, Cook A J, Catz S, Fishman P A, McClure J B, and Reid R J (2014) e-Care for Heart Wellness: A Feasibility Trial to Decrease Blood Pressure and Cardiovascular Risk, <i>American Journal of Preventive Medicine</i> 46 : 368-377</p>	<p>To evaluate whether a Web-based dietitian-led (WD) team care intervention was feasible and resulted in decreased BP, CVD risk, and weight compared to usual care (UC).</p> <p>Methods: Electronic health record (EHR) data identified patients aged 30-69 years with BMI >26, elevated BP, and 10%-25% 10-year Framingham CVD risk who were registered patient website users. Patients with uncontrolled BP at screening were randomized to UC or WD, which included a home BP monitor, scale, and dietitian team care. WD participants had a single in-person dietitian visit to obtain baseline information and create a plan to reduce CVD risk. Planned follow-up occurred via secure messaging to report BP, weight, and fruit and vegetable intake and receive ongoing feedback. If needed, dietitians encouraged patients and their physicians to intensify antihypertensive and lipid-lowering medications.</p> <p>Primary outcomes were change in systolic BP and weight loss =4 kg at 6 months. Feasibility outcomes included intervention utilization and satisfaction.</p>	<p>Between 2010 and 2011, a total of 90 of 101 participants completed 6-month follow-ups. The WD group had higher rates of secure messaging utilization and patient satisfaction. The WD group lost significantly more weight than the UC group (adjusted net difference=-3.2 kg, 95% CI=-5.0, -1.5, p<0.001) and was more likely to lose =4 kg (adjusted relative risk [RRadj]=2.96, 95% CI=1.16, 7.53). BP control and CVD risk reduction were greater in WD than UC, but differences were not statistically significant.</p> <p>Conclusions: WD intervention was feasible and resulted in decreased weight, BP, and CVD risk. A larger trial is justified</p>
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<p>Mettler E A, Preston H R, Jenkins S M, Lackore K A, Werneburg B L, Larson B G, Bradley K L, Warren B A, Olsen K D, Hagen P T, Vickers K S and Clark M M (2014) Motivational Improvements for Health Behavior Change from Wellness Coaching, <i>American Journal of Health Behavior</i> 38 (1) : 83-91</p>	<p>To identify client priorities prior to wellness coaching, and examine motivational improvements for health behaviors on follow-up. Methods: Clients completed a wellness questionnaire at baseline (before coaching) and at a 3-month follow-up. Overall, 177 participants (92% female, average age 42.9 (SD 11.2) years) were included in the analysis. Clients indicated priorities for coaching, and levels of importance, confidence, and readiness to change within each domain were compared between baseline and follow-up.</p>	<p>Participants identified weight management as their top priority and successfully reduced their BMI. Participants also demonstrated significant improvements in motivation and confidence in most health behavior domains. Conclusions: These results provide further support for the effectiveness of wellness coaching for weight management and for improving motivational readiness for behavior change.</p>
<p>Blake H, Zhou D and , Batt M E (2013) Five-year workplace wellness intervention in the NHS, <i>Perspectives in Public Health</i> 133 (5) : 262-271</p>	<p>The objective of this study was to deliver and evaluate a five-year employee wellness programme aimed at improving the health and well-being of employees in a large NHS workplace. Method: A theory-driven multi-level ecological workplace wellness intervention was delivered including health campaigns, provision of facilities and health-promotion activities to encourage employees to make healthy lifestyle choices and sustained behaviour changes. An employee questionnaire survey was distributed at baseline (n = 1,452) and at five years (n = 1,134), including measures of physical activity, BMI, diet, self-efficacy, social support, perceived general health and mood, smoking behaviours, self-reported sickness absence, perceived work performance and job satisfaction.</p>	<p>At five years, significantly more respondents actively travelled (by walking or cycling both to work and for non-work trips) and more were active while at work. Significantly more respondents met current recommendations for physical activity at five years than at baseline. Fewer employers reported 'lack of time' as a barrier to being physically active following the intervention. Significantly lower sickness absence, greater job satisfaction and greater organisational commitment was reported at five years than at baseline. Authors' Conclusions: Improvements in health behaviours, reductions in sickness absence and improvements in job satisfaction and organisational commitment were observed following five years of a workplace wellness intervention for NHS employees. These findings suggest that health-promoting programmes should be embedded within NHS infrastructure.</p>

<p>Cook J A, Copeland M E, Bailey Floyd C, Jonikas J A, Hamilton M M, Razzano L, Carter T M, Hudson W B, Grey D D and Boyd S (2012) A Randomized Controlled Trial of Effects of Wellness Recovery Action Planning on Depression, Anxiety, and Recovery, <i>Psychiatric Service</i> 63 (6)</p>	<p>The purpose of this study was to test the effectiveness of the Wellness Recovery Action Planning (WRAP) self-management intervention in reducing depression and anxiety and in increasing self-perceived recovery among individuals with a serious mental illness.</p> <p>Methods: Participants were recruited from outpatient community mental health settings in six Ohio communities: Canton, Cleveland, Columbus, Dayton, Lorain, and Toledo. With a single-blind, randomized controlled trial design, 519 individuals were assigned to WRAP or to services as usual and assessed at baseline and at two- and eight-month follow-ups.</p> <p>The intervention consisted of eight weekly 2.5-hour sessions delivered by peers in recovery from serious mental illness who were certified WRAP educators.</p> <p>The mean number of WRAP sessions attended was five, and fidelity ranged from 90% to 92%.</p>	<p>Analysis using mixed-effects random regression revealed interactions of study condition by time in each outcome area. Compared with the control group, intervention participants reported significantly greater reduction over time in Brief Symptom Inventory depression and anxiety subscales and significantly greater improvement in total Recovery Assessment Scale scores as well as the subscales measuring personal confidence and goal orientation.</p> <p>Conclusions: Training in mental illness self-management reduced depression and anxiety and improved participants' self-perceived recovery over time. Results confirmed the importance of WRAP as part of a group of evidence-based, recovery-oriented interventions.</p>
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<p>Clark F, Jackson J, Carlson M, Chou C-P, Cherry B J, Jordan-Marsh M, Knight B G, Mandel D, Blanchard J, Granger D A, Wilcox R R, Lai M Y, White B, Hay J, Lam C, Marterella A and Azen S P (2012) Effectiveness of a lifestyle intervention in promoting the well-being of independently living older people: results of the Well Elderly 2 Randomised Controlled Trial, <i>Journal of Epidemiology and Community Health</i> 66 (9) : 782-790</p>	<p>To determine the effectiveness and cost-effectiveness of a preventive lifestyle-based occupational therapy intervention, administered in a variety of community-based sites, in improving mental and physical well-being and cognitive functioning in ethnically diverse older people. Methods: A randomised controlled trial was conducted comparing an occupational therapy intervention and a no-treatment control condition over a 6-month experimental phase. Participants included 460 men and women aged 60–95 years (mean age 74.9±7.7 years; 53% <\$12?000 annual income) recruited from 21 sites in the greater Los Angeles metropolitan area.</p>	<p>Intervention participants, relative to untreated controls, showed more favourable change scores on indices of bodily pain, vitality, social functioning, mental health, composite mental functioning, life satisfaction and depressive symptomatology (ps<0.05). The intervention group had a significantly greater increment in quality-adjusted life years (p<0.02), which was achieved cost-effectively (US \$41?218/UK £24?868 per unit). No intervention effect was found for cognitive functioning outcome measures. Conclusions A lifestyle-oriented occupational therapy intervention has beneficial effects for ethnically diverse older people recruited from a wide array of community settings. Because the intervention is cost-effective and is applicable on a wide-scale basis, it has the potential to help reduce health decline and promote well-being in older people.</p>
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<p>Demark-Wahnefried W, Morey M C, Sloane R, Snyder D C, Miller P E, Hartman T J and Cohen H J (2012) Reach Out to Enhance Wellness Home-Based Diet-Exercise Intervention Promotes Reproducible and Sustainable Long-Term Improvements in Health Behaviors, Body Weight, and Physical Functioning in Older, Overweight/Obese Cancer Survivors, <i>Journal of Clinical Oncology</i> 30 (19) : 2354-2361</p>	<p>To assess long term adherence and health outcomes of diet and exercise interventions as a means to reduce late effects and co-morbidity in cancer survivors.</p> <p>Methods Between July 2005 and May 2007, the Reach Out to Enhance Wellness (RENEW) trial accrued 641 loco-regionally staged, long-term (= 5 years from diagnosis) colorectal, breast, and prostate cancer survivors in the United States (21 states), Canada, and the United Kingdom. All participants were sedentary (< 150 minutes of physical activity [PA] a week), overweight or obese (body mass index, 25 to 40 kg/m²), and over age 65 years.</p> <p>The trial tested a diet-exercise intervention delivered via mailed print materials and telephone counselling. RENEW used a wait-list control, cross-over design (ie, participants received the year-long intervention immediately or after a 1-year delay), which allowed the opportunity to assess program efficacy (previously reported primary outcome), durability, and reproducibility (reported herein).</p> <p>Measures included diet quality (DQ), PA, BMI, and physical function (PF).</p>	<p>No significant relapse was observed in the immediate-intervention arm for DQ, PA, and BMI; however, rates of functional decline increased when the intervention ceased. From year 1 to year 2, significant improvements were observed in the delayed-intervention arm; mean change scores in behaviors and BMI and PF slopes were as follows: DQ score, 5.2 (95% CI, 3.4 to 7.0); PA, 45.8 min/wk (95% CI, 26.9 to 64.6 min/wk); BMI, -0.56 (95% CI, -0.75 to -0.36); and Short Form-36 PF, -1.02 versus -5.52 (P < .001 for all measures). Overall, both arms experienced significant improvements in DQ, PA, and BMI from baseline to 2-year follow-up (P < .001).</p> <p>Conclusion Older cancer survivors respond favourably to lifestyle interventions and make durable changes in DQ and PA that contribute to sustained weight loss. These changes positively reorient functional decline trajectories during intervention delivery.</p>
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<p>Kaspin L C, Gorman K M and Miller R M (2012) Systematic Review of Employer-Sponsored Wellness Strategies and their Economic and Health-Related Outcomes, <i>Population</i></p>	<p>This review determines the characteristics and health-related and economic outcomes of employer-sponsored wellness programs and identifies possible reasons for their success.</p> <p>Wellness interventions were classified into health assessments, lifestyle management, and behavioural health. Improved economic outcomes were reported (health care costs, return on investment, absenteeism, productivity, workers' compensation, utilization) as well as decreased health risks.</p>	<p>Programs associated with favourable outcomes had several characteristics in common:</p> <p>First, the corporate culture encouraged wellness to improve employees' lives, not only to reduce costs.</p> <p>Second, employees and leadership were strongly motivated to support the wellness programs and to improve their health in general.</p> <p>Third, employees were motivated by a participation-friendly corporate policy and physical environment.</p> <p>Fourth, successful programs adapted to the changing needs of the employees.</p> <p>Fifth, community health organizations provided support, education, and treatment.</p> <p>Sixth, successful wellness programs utilized technology to facilitate health risk assessments and wellness education.</p> <p>Improved health-related and economic outcomes were associated with employer-sponsored wellness programs. Companies with successful programs tended to include wellness as part of their corporate culture and supported employee participation in several key ways.</p>
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<p>Merrill R M, Aldana S G, Garrett J and Ross C (2011) Effectiveness of a Workplace Wellness Program for Maintaining Health and Promoting Healthy Behaviors, <i>Journal of Occupational & Environmental Medicine</i> 53 (7) : 782-787</p>	<p>This study assessed the effectiveness of a worksite wellness program. Assessment was based on 3737 continuously employed workers at a large agribusiness during 2007–2009. More than 80% of employees participated in the program, with a higher percentage of women participating.</p>	<p>Clinically significant improvements occurred in those who were underweight, those with high systolic or diastolic blood pressure, high total cholesterol, high low-density lipoprotein, low high-density lipoprotein, high triglycerides, and high glucose. Among obese employee participants, significant improvements occurred in selected mental health and dietary variables. Among those who lowered their BMI, significant decrease occurred in fat intake, and significant increase resulted in weekly aerobic exercise and feelings of calmness and peace, happiness, ability to cope with stress, and more physical energy.</p>
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<p>Yamada T, Kawamata H, Kobayashi N, Kielhofner G and Taylor R R (2010) A randomised clinical trial of a wellness programme for healthy older people, <i>The British Journal of Occupational Therapy</i> 73 (11) : 540-548</p>	<p>This randomised clinical trial employed a parallel design, with an experimental and a control group and a pre-test and post-test, to evaluate the effectiveness of a wellness programme based on the Model of Human Occupation (MOHO). Participants were 65 years of age or older, community-dwelling Japanese older people. Data were analysed for 30 experimental participants who received a 15-session MOHO programme and 33 controls who received a 15-session standard care, crafts programme. Quality of life and psychological wellbeing were compared between groups using the Japanese versions of the Life Satisfaction Index – Z (LSI-Z) and the World Health Organisation Quality of Life-26 (QOL26), respectively.</p>	<p>The LSI-Z score for the experimental group improved an average of 3.4 points whereas the control group's mean score improved by 0.1 point. The mean change for the experimental group (m.chg = 3.4, SD = 5.8) was significantly different ($p = 0.01$) from that of the control group (m.chg = 0.1, SD = 4.8) and the effect size (Cohen's d) was 0.62 (95% confidence interval = 0.13-1.11). The psychological domain score (QOL26) improved slightly for the experimental group whereas it declined slightly for the control group. The mean change was significantly different ($p = 0.02$) between the experimental (m.chg = 0.1, SD = 0.5) and control (m.chg = -0.1, SD = 0.3) groups; effect size (Cohen's d) was 0.49 (95% confidence interval = 0.02-0.96).</p> <p>Conclusion: The findings support the conclusion that MOHO-based occupational therapy interventions can promote wellness effectively in older people by having an impact on quality of life and sense of wellbeing.</p>
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<p>Stuifbergen A E, Blozis S A, Becker H, Phillips L, Timmerman G, Kullberg V, Taxis C and Morrison J (2010) A randomized controlled trial of a wellness intervention for women with fibromyalgia syndrome, <i>Clinical Rehabilitation</i> 24 (4) : 305-318</p>	<p>A randomized controlled single-blinded trial with treatment and attention-control groups to examine the effects of a wellness intervention, Lifestyle Counts, for women with fibromyalgia syndrome on the level of self-efficacy for health-promoting behaviours, health-promoting activity and perceived quality of life.</p> <p>Setting: A convenience sample of 187 women (98 treatment, 89 attention control) with fibromyalgia syndrome (mean age = 53.08 years, SD 9.86) from a community in the south-western United States.</p> <p>Intervention: The two-phase Lifestyle Counts intervention programme included lifestyle change classes for eight weeks, with goal-setting and telephone follow-up for three months. Participants in the attention-control group were offered an equivalent amount of contact in classes on general disease-related information and health education topics and unstructured follow-up phone calls. Participants were followed for a total of eight months after baseline.</p> <p>Outcome measures: Self-report instruments measuring self-efficacy for health behaviours, health-promotion behaviours and health-related quality of life (SF-36 and the Fibromyalgia Impact Questionnaire) were completed at baseline, two months (after the classes), five months (after telephone follow-up) and at eight months.</p>	<p>Both groups improved significantly ($P < 0.05$) over time on the measures of self-efficacy, health behaviours, fibromyalgia impact and quality of life. There were significant group \times time interactions for scores on the Health Promoting Lifestyle II subscales of physical activity and stress management.</p> <p>Authors' conclusions: The Lifestyle Counts wellness intervention holds promise for improving health-promoting behaviours and quality of life of women with fibromyalgia syndrome.</p>
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<p>Stuifbergen A K, Morris M, Jung J H, Pierini D and Morgan S (2010) Benefits of wellness interventions for persons with chronic and disabling conditions: a review of the evidence., <i>Disability and Health Journal</i> 3 (3) : 133-145</p>	<p>To review the evidence for the benefits of wellness/health promotion interventions for persons with chronic and disabling conditions. Methods: Selection of studies was limited to those published in English that reported randomized controlled trails or prospective studies that involved adult human subjects with a chronic and/or disabling condition. All selected studies focused on some aspect of a wellness or health promotion intervention and involved a comparison or control group. Of the 5,847 studies initially identified in the search using medical subject heading terms, 190 met the criteria for full review. Data were extracted from these publications and summarized using descriptive statistics.</p>	<p>Almost all studies (95%) explored the effects of wellness intervention in a sample diagnosed with a single condition (e.g., cancer, stroke, arthritis). Although the mean sample size was 100, the range in sample size varied widely (6-688); 25% of the studies had sample of 30 or fewer. Almost all studies (89.5%) reported positive effects of the wellness intervention, although the delivery and content of interventions, as well as the measurement of outcomes, varied greatly.</p> <p>Conclusions: Findings support an immediate post-intervention positive impact of wellness interventions across persons with a wide variety of chronic and disabling conditions.</p>
<p>Mhurchu C N, Aston L M and Jebb S A (2010) Effects of worksite health promotion interventions on employee diets: a systematic review, <i>BMC Public Health</i> 10 (62)</p>	<p>Review to assess the effects of worksite interventions on employee diets. Studies were eligible for inclusion if they were peer-reviewed English language publications describing a worksite-based health promotion intervention with minimum study duration of eight weeks. All study designs were eligible. Studies had to report one or more diet-related outcome (energy, fat, fruit, or vegetable intakes). Sixteen studies were included in the review. Eight programmes focussed on employee education, and the remainder targeted change to the worksite environment, either alone or in combination with education. Study methodological quality was moderate.</p>	<p>In general, worksite interventions led to positive changes in fruit, vegetable and total fat intake. However, reliance on self-reported methods of dietary assessment means there is a significant risk of bias. No study measured more robust outcomes such as absenteeism, productivity, or healthcare utilisation.</p> <p>Conclusions: Worksite health promotion programmes are associated with moderate improvement in dietary intake.</p>

<p>Porsdal V, Beal C, Kleivenes O K, Martinsen E W, Lindström E, Nilsson H and Svanborg P (2010) The Scandinavian Solutions for Wellness study - a two-arm observational study on the effectiveness of lifestyle intervention on subjective well-being and weight among persons with psychiatric disorders., <i>BMC Psychiatry</i> 10 (42)</p>	<p>This observational study assessed the impact on subjective well-being, weight and waist circumference (WC) of 'Solutions for Wellness' (SfW), an 3-month educational program concerning nutrition and exercise for persons with psychiatric disorders on psychotropic medication, who have weight problems.</p> <p>Data was collected at 49 psychiatric clinics. Where the SfW program was offered patients could enter the intervention group; where not, the control group. Subjective well-being was measured by the Subjective Well-being under Neuroleptics scale (SWN), at baseline, at the end of SfW participation, and at a follow-up 6 months after baseline. Demographic, disease and treatment data was also collected.</p> <p>314 patients enrolled in the SfW group, 59 in the control group. 54% of the patients had schizophrenia, 67% received atypical antipsychotics, 56% were female. They averaged 41 +/- 12.06 years and had a BMI of 31.4 +/- 6.35. There were significant differences at baseline between groups for weight, SWN total score and other factors.</p>	<p>Stepwise logistic models controlling for baseline covariates yielded an adjusted non-significant association between SfW program participation and response in subjective well-being (SWN increase). However, statistically significant associations were found between program participation and weight-response (weight loss or gain < 1 kg) OR = 2; 95% CI [1.1; 3.7] and between program participation and WC-response (WC decrease or increase < 2 cm) OR = 5; 95% CI [2.4; 10.3]), at 3 months after baseline.</p> <p>Conclusions: SfW program participation was associated with maintaining or decreasing weight and WC but not with improved subjective well-being as measured with the SWN scale.</p>
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<p>Baicker K, Cutler D and Song Z (2010) Workplace wellness programs can generate savings, <i>Health Affairs</i> 29 (2) : 304-311</p>	<p>A critical meta-analysis of the literature on costs and savings associated with workplace disease prevention and wellness.</p> <p>Health risk assessment is used in 80 percent of the studies, most commonly serving as the initial intervention or requirement for participation in the wellness program.</p> <p>The second most common wellness intervention mechanism was the provision of self-help education materials, individual counselling with health care professionals, or on-site group activities led by trained personnel.</p> <p>The use of incentives to motivate participation was seen in 30 percent of programs.</p> <p>The most common foci of the programs were obesity and smoking.</p>	<p>The study found that medical costs fall about \$3.27 for every dollar spent on wellness programs, and absentee day costs fall by about \$2.73 for every dollar spent.</p> <p>Averaging across all programs in which they were reported, the interventions produced \$358 in savings through reduced health costs per employee per year, while costing the employer \$144 per employee per year. The average calculated ROI across the 15 studies that reported program costs was 3.37.</p>
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<p>Williams K A, Kolar M M, Reger B E and Pearson J C (2001) Evaluation of a Wellness-based Mindfulness Stress Reduction Intervention: A Controlled Trial, <i>American Journal of Health Promotion</i> 15 (6) : 422-432</p>	<p>A randomized controlled trial of a stress reduction intervention with a 3-month follow-up to determine if participation in a Wellness-Based Mindfulness Stress Reduction intervention decreases the effect of daily hassles, psychological distress, and medical symptoms.</p> <p>The study looked at 103 adults, with 59 in the intervention group and 44 in the control group. Eight-five percent of subjects completed the intervention. Fifty-nine percent and 61% of the intervention and control subjects completed the study, respectively.</p> <p>The intervention consisted of an 8-week group stress reduction program in which subjects learned, practiced, and applied “mindfulness meditation” to daily life situations. The control group received educational materials and were encouraged to use community resources for stress management.</p> <p>The Daily Stress Inventory assessed the effect of daily hassles, the Revised Hopkins Symptom Checklist measured psychological distress, the Medical Symptom Checklist measured number of medical symptoms, and a follow-up questionnaire measured program adherence.</p>	<p>Intervention subjects reported significant decreases from baseline in effect of daily hassles (24 %), psychological distress, (44 %), and medical symptoms (46 %) were maintained at the 3-month follow-up compared to control subjects (repeated measures analysis of variance [ANOVA] $p < .05$).</p> <p>Conclusions. Self-selected community residents can improve their mental and physical health by participating in a stress reduction intervention as part of a wellness program.</p>
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c) Alternative group therapies - Tai Chi and Yoga

Study	Methods	Findings
Chan A S, Sze S L, Woo J and Yu R H (2014) A Chinese Chan-based lifestyle intervention improves memory of older adults, <i>Frontiers in Aging Neuroscience</i> 6 (50)	This study aimed to explore the potential benefits of a Chinese Chan-based lifestyle intervention on enhancing memory in older people with lower memory function. Forty-four aged 60–83 adults with various level of memory ability participated in the study. Their memories (including verbal and visual components) were assessed before and after 3 months intervention. The intervention consisted of 12 sessions, with one 90 min session per week. The intervention involved components of adopting a special vegetarian diet, practicing a type of mind–body exercises, and learning self-realization.	Older people with lower memory function at the baseline (i.e., their performance on standardized memory tests was within 25th percentile) showed a significant memory improvement after the intervention. Their verbal and visual memory performance has showed 50 and 49% enhancement, respectively. In addition, their improvement can be considered as a reliable and clinically significant change as reflected by their significant pre–post differences and reliable change indices. Such robust treatment effect was found to be specific to memory functions, but less influencing on the other cognitive functions.

<p>Bernstein A M, Bar J, Pernotto Ehrman J, Golubic M and Roizen M F (2014) Yoga in the Management of Overweight and Obesity, <i>American Journal of Lifestyle Medicine</i> 8 (1) : 33-41</p>	<p>A review to determine whether yoga helps with weight loss or maintenance beyond that which can be achieved with diet and exercise. Studies on yoga and weight loss are challenged by small sample sizes, short durations, and lack of control groups. In addition, there is little consistency in terms of duration of formal group yoga practice sessions, duration of informal practices at home, and frequency of both.</p>	<p>Studies suggest that yoga may be associated with weight loss or maintenance. Mechanisms by which yoga may assist with weight loss or maintenance include the following: (a) energy expenditure during yoga sessions; (b) allowing for additional exercise outside yoga sessions by reducing back and joint pain; (c) heightening mindfulness, improving mood, and reducing stress, which may help reduce food intake; and (d) allowing individuals to feel more connected to their bodies, leading to enhanced awareness of satiety and the discomfort of overeating. Thus, yoga appears promising as a way to assist with behavioural change, weight loss, and maintenance.</p>
<p>Lee M S and Ernst E (2011) Systematic reviews of t'ai chi: an overview, <i>British Journal of Sports Medicine</i></p>	<p>The aim of this overview was to critically evaluate Systematic Reviews of t'ai chi for any improvement of medical conditions or clinical symptoms. English, Chinese and Korean electronic databases were searched for relevant articles, and data were extracted according to predefined criteria; 35 SRs met the inclusion criteria. They were related to the following conditions: cancer, older people, Parkinson's disease, musculoskeletal pain, osteoarthritis, rheumatoid arthritis (RA), muscle strength and flexibility, improving aerobic capacity, cardiovascular disease and risk factors, lowering resting blood pressure, osteoporosis or bone mineral density, type 2 diabetes, psychological health, fall prevention and improving balance, and any chronic conditions.</p>	<p>The conclusions of the articles were contradictory. Relatively clear evidence emerged to suggest that t'ai chi is effective for fall prevention and improving psychological health and was associated with general health benefits for older people. However, t'ai chi seems to be ineffective for the symptomatic treatment of cancer and RA. Conclusion, many SRs of t'ai chi have recently been published; however, the evidence is convincingly positive only for fall prevention and for improvement of psychological health.</p>

<p>Hakim R M, Kotroba E, Teel S and Leininger P M (2010) A cross-sectional study of balance-related measures with older adults who participated in Tai Chi, yoga, or no exercise, <i>Physical & Occupational Therapy in Geriatrics</i> 28 (1) : 63-74</p>	<p>A cross-sectional study compared balance-related measures in older adults who perform Tai Chi, yoga, or no exercise. A convenience sample of 52 healthy, older adults (>65 years old) was categorized according to their current participation in Tai Chi (n = 21), yoga (n = 11), or no exercise (n = 20). Each participant was measured on one occasion with the following balance-related measures: Single Limb Stance (SLS), the Multidirectional Reach Test (MDRT), the Fullerton Advanced Balance Scale (FAB), the Activities-Specific Balance Confidence Scale (ABC), and the Timed Floor Transfer (TFT). The data were examined using multiple one-way analysis of variance (ANOVA) procedures followed by Tukey's HSD post-hoc analysis.</p>	<p>There were no significant differences between the groups for SLS and ABC scores. The Tai Chi and yoga groups scored significantly higher on the FAB (p = 0.001) than the no-exercise group. The Tai Chi group scored significantly higher than both the yoga and no-exercise groups on all directions of the MDRT (p < 0.01), and the yoga group scored significantly higher than the no-exercise group on the MDRT left (p = 0.004) and MDRT right (p = 0.008). For the TFT, percentage rates for those able to complete the task were as follows: Tai Chi group = 76.1%, yoga group = 54.5%, and no-exercise group = 30.0%; those not tested were either unable or unwilling to perform the test. Conclusion: Both the Tai Chi and yoga exercise groups demonstrated better balance performance than the no-exercise group. Tai Chi and yoga are both economical and effective methods of low impact exercise that can be incorporated into a fall-prevention program for older adults in many settings</p>
<p>Ross A and Thomas S (2010) The health benefits of yoga and exercise: A review of comparison studies, <i>The journal of alternative and complementary medicine</i> 16 (1) : 3-12</p>	<p>A review of research studies comparing the effects of yoga and exercise on a variety of health outcomes and health conditions. The studies subsequently were classified as uncontrolled (n=30), wait list controlled (n=16), or comparison (n=35). The most common comparison intervention (n=10) involved exercise.</p>	<p>Yoga interventions appeared to be equal or superior to exercise in nearly every outcome measured except those involving physical fitness. Conclusions: The studies comparing the effects of yoga and exercise seem to indicate that, in both healthy and diseased populations, yoga may be as effective as or better than exercise at improving a variety of health-related outcome measures.</p>

<p>Audette J F, Jin Y S, Newcomer R (et al) (2006) Tai Chi versus brisk walking in elderly women, <i>Age and Ageing</i> 35 (4) : 388-393</p>	<p>26 community-dwelling, sedentary healthy women aged 65+ (mean age 71.4) in the Boston area were recruited to this US study. 11 were randomly assigned to Tai Chi Chuan, 8 to a brisk walking group, and 8 acted as a sedentary comparison group. The exercise groups met for 1 hour, 3 days a week for 12 weeks.</p>	<p>The study found that a short form of Tai Chi can have a significant effect on older women's aerobic fitness. Indeed, Tai Chi is at least as effective as brisk walking in enhancing aerobic fitness in older women. Moreover, Tai Chi has other benefits on fitness, including enhancing lower extremity strength and balance that brisk walking does not.</p>
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d) Arts and music – dancing and singing

Study	Methods	Findings
<p>Bento-Allpress R (2013) <i>Effects of Group Singing on Well-Being: Empirical Findings and Methodological Considerations</i>; Thesis submitted for the degree of Doctor of Philosophy, Canterbury Christ Church University</p>	<p>This study compared effects of two group activities singing and a non-musical activity on mood, cortisol levels, social connection and flow states. Two groups of participants took part in both a group singing session and a non-musical group activity session. The effects investigated were those on mood (as measured by positive and negative affective states), salivary cortisol, feelings of connection with those around them, states of flow and personal growth. Mood and salivary cortisol levels were measure before and after each session; social connection, flow states and personal growth were measured after each session.</p>	<p>In the short-term, group singing improved mood by increasing positive affect and reducing negative affect; had objective effects on the endocrine system, which in the circumstances studied here, were rejected in a reduction in cortisol levels, often associated with relaxation; promoted social connection and bonding, as well as feelings of achievement and personal growth. While the control activity used the study promoted some of these effects (i.e., increased positive affect, reduced cortisol levels, and involved several dimensions that indicated it was also a flow activity), Group singing had effects over and above those of the control activity, as was able to have stronger psychological, physiological and social effects and, in some instances, have effects where the control activity did not (e.g. decrease negative affect). Overall, these findings provided evidence to suggest that group singing could indeed promote well-being as a whole. The study provides experimental evidence that group singing could have, in one single experience, psychological, physiological and social effects which could be related to hedonic, eudaimonic and social domains of well-being.</p>

<p>Clift S, Hancox G, Morrison I, Hess B, Kreutz G and Stewart D (2010) Choral singing and psychological wellbeing: Quantitative and qualitative findings from English choirs in a cross-national survey, <i>Journal of Applied Arts and Health</i> 1 (1) : 19-34</p>	<p>Over 600 choral singers drawn from English choirs completed the WHOQOL-BREF questionnaire to measure physical, psychological, social and environmental wellbeing, and a twelve-item 'wellbeing and choral singing scale'. They also provided accounts of the effects of choral singing on quality of life, wellbeing and physical health in response to open questions.</p>	<p>High average scores were found on all WHOQOL-BREF scales, and a high degree of consensus emerged on the positive benefits of choral singing. A significant sex difference was found on the choral singing scale, with women endorsing the wellbeing effects of singing more strongly than men. Low correlations were found between the WHOQOL-BREF psychological wellbeing scale and perceptions of wellbeing associated with singing..</p>
<p>Keogh J W L, Kilding A, Pidgeon P, Ashley L and Gillis D (2009) Physical benefits of dancing for healthy older adults: A review, <i>Journal of Aging and Physical Activity</i> 17 : 1-23</p>	<p>A review of the physical benefits of dancing for healthy older adults. Fifteen training and 3 cross-sectional studies that met the inclusion criteria were reviewed.</p>	<p>Grade B–level evidence indicated that older adults can significantly improve their aerobic power, lower body muscle endurance, strength and flexibility, balance, agility, and gait through dancing. Grade C evidence suggested that dancing might improve older adults' lower body bone-mineral content and muscle power, as well as reduce the prevalence of falls and cardiovascular health risks. Further research is, however, needed to determine the efficacy of different forms of dance, the relative effectiveness of these forms of dance compared with other exercise modes, and how best to engage older adults in dance participation.</p>

<p>Sixsmith A and Gibson G (2007) Music and the well-being of people with dementia, <i>Ageing and Society</i> 27 (1) : 127-146</p>	<p>This paper presents the results of qualitative research that explores the meaning and importance of music in everyday life; the benefits derived from participation in music-related activities; and the problems of engaging with music.</p> <p>Data were collected during in-depth interviews with 26 people with dementia and their carers, who lived either in their own homes or in residential care in different parts of England.</p>	<p>As well as being enjoyed in its own right, music can enable people to participate in activities that are enjoyable and personally meaningful. It is an important source of social cohesion and social contact, supports participation in various activities within and outside the household, and provides a degree of empowerment and control over their everyday situations.</p>
<p>Jeon M Y, Bark E S, Lee E G, Im J S, Jeong B S and Choe E S (2005) The effects of a Korean traditional dance movement program in elderly women [article in Korean], <i>Taehan Kanho Hakhoe Chi</i> 35 (7) : 1268-1276</p>	<p>This study was aimed to identify the effects of a 12 week Korean traditional dance movement program on balance, depression, medical cost, medical institution's utilization and fall among elderly women.</p> <p>Using a quasi-experimental design, the experimental group was composed of 130 subjects and the control group was composed of 123 subjects. The experimental group participated in a 12 week Korean traditional dance movement program 3 times a week from December 2002 to February 2003. Data was analyzed with descriptive statistics, the chi-square test, paired t-test and t-test.</p>	<p>There was significant improvement in balance (right leg $p=.000$, left leg $p=.004$), depression ($p=.000$), and the medical institution's utilization ($p=.001$) and fall ($p=.002$) in the experimental group compared to the control group.</p> <p>Conclusion: A Korean traditional dance movement program improved balance, depression, and decreased fall and medical cost in elderly women. Therefore, they recommend this program be utilized as a health promoting program and falls preventing program for the elderly in the community.</p>

e) Falls prevention

Study	Methods	Findings
<p>Hakim R M, Kotroba E, Teel S and Leininger P M (2010) A cross-sectional study of balance-related measures with older adults who participated in Tai Chi, yoga, or no exercise, <i>Physical & Occupational Therapy in Geriatrics</i> 28 (1) : 63-74</p>		<p>See Alternative group therapies</p>
<p>Gillespie L D, Robertson M C, Gillespie W J, Lamb S E, Gates S, Cumming R G and Rowe B H; The Cochrane Collaboration (2009) <i>Interventions for preventing falls in older people living in the community (Review)</i>, Wiley : 327</p>		<p>This review contains 111 trials with 55,303 participants. Included trials ranged in sample size from 10 to 9940 . The median sample size was 239 participants.</p> <p>Exercises: Overall, multiple-component exercise interventions are effective in reducing rate and risk of falling.</p> <p>Vitamin D supplementation: The effectiveness of vitamin D for reducing falls, with or without calcium, remains unclear. Overall vitamin D did not significantly reduce either rate of falls or risk of falling. However, when administered to older people selected on the basis of low vitamin D level, supplementation was effective in reducing rate of falls, and risk of falling.</p> <p>Environment/Assistive technology: Home safety interventions failed to significantly reduce rate of falls or risk of falling but use of an anti-slip shoe device for icy conditions significantly reduced winter outside falls and, for people with poor vision, home safety intervention appears effective in reducing both rate of falls and risk of falling.</p> <p>Multi-factorial interventions: Assessment and multi-factorial intervention is effective in reducing rate of falls but does not, overall, have a significant effect on risk of falling</p>

<p>Sherrington C, Whitney J C, Lord S R, Herbert R D, Cumming R G and Close J C T (2008) Effective Exercise for the Prevention of Falls: A Systematic Review and Meta-Analysis, <i>Journal of the American Geriatrics Society</i> 56 (12) : 2234-2243</p>	<p>To determine the effects of exercise on falls prevention in older people and establish whether particular trial characteristics or components of exercise programs are associated with larger reductions in falls.</p> <p>A Systematic review with meta-analysis of randomized controlled trials that compared fall rates in older people who undertook exercise programs with fall rates in those who did not exercise.</p>	<p>The pooled estimate of the effect of exercise was that it reduced the rate of falling by 17% (44 trials with 9,603 participants, rate ratio (RR)=0.83, 95% confidence interval (CI)=0.75–0.91, P<.001, I2=62%). The greatest relative effects of exercise on fall rates (RR=0.58, 95% CI=0.48–0.69, 68% of between-study variability explained) were seen in programs that included a combination of a higher total dose of exercise (>50 hours over the trial period) and challenging balance exercises (exercises conducted while standing in which people aimed to stand with their feet closer together or on one leg, minimize use of their hands to assist, and practice controlled movements of the centre of mass) and did not include a walking program.</p> <p>Conclusion: Exercise can prevent falls in older people. Greater relative effects are seen in programs that include exercises that challenge balance, use a higher dose of exercise, and do not include a walking program.</p>
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<p>Barnett A, Smith B, Lord S R, Williams M and Baumann A (2003) Community-based group exercise improves balance and reduces falls in at-risk older people: a randomised controlled trial, <i>Age and Ageing</i> 32 (4) : 407-414</p>	<p>To determine whether participation in a weekly group exercise programme with ancillary home exercises over one year improves balance, muscle strength, reaction time, physical functioning, health status and prevents falls in at-risk community-dwelling older people.</p> <p>Methods: the sample comprised 163 people aged over 65 years identified as at risk of falling using a standardised assessment screen by their general practitioner or hospital-based physiotherapist, residing in South Western Sydney, Australia. Subjects were randomised into either an exercise intervention group or a control group. Physical performance and general health measures were assessed at baseline and repeated 6-months into the trial. Falls were measured over a 12-month follow-up period using monthly postal surveys. At baseline both groups were well matched in their physical performance, health and activity levels. The intervention subjects attended a median of 23 exercise classes over the year, and most undertook the home exercise sessions at least weekly.</p>	<p>At retest, the exercise group performed significantly better than the controls in three of six balance measures; postural sway on the floor with eyes open and eyes closed and coordinated stability. The groups did not differ at retest in measures of strength, reaction time and walking speed or on Short-Form 36, Physical Activity Scale for the Elderly or fear of falling scales. Within the 12-month trial period, the rate of falls in the intervention group was 40% lower than that of the control group (IRR=0.60, 95% CI 0.36–0.99).</p> <p>Conclusions: these findings indicate that participation in a weekly group exercise programme with ancillary home exercises can improve balance and reduce the rate of falling in at-risk community dwelling older people.</p>
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<p>Pardessus V, Puisieux F, Di Pompeo C, Gaudefroy C, Thevenon A and Dewailly P (2002) Benefits of Home Visits for Falls and Autonomy in the Elderly: A Randomized Trial Study, <i>American Journal of Physical Medicine & Rehabilitation</i> 81 (4) : 247-252</p>	<p>To investigate whether home visits by a occupational therapist reduces the risk of falling and improves the autonomy of older patients hospitalized for falling. In this randomized, controlled trial set in a geriatric hospital, 60 patients (mean age, 83.5 yr) who were hospitalized for falling were recruited from the acute medicine department. A home visit from an occupational therapist and an ergotherapist assessed patients' homes for environmental hazards and recommended modifications. The outcomes measured were falls, autonomy, hospitalization for falling, institutionalization, and death.</p>	<p>During the follow-up period, the rate of falls, hospitalization for falls, institutionalization, and death were not significantly different between the two groups. Both groups had a loss of dependence at 12 months. This loss of dependence was significant in the control group but not in the intervention group. Conclusions: Home visits from occupational therapists during hospitalization of older patients at risk for falling can help to preserve the patient's autonomy.</p>
<p>Gregg E W, Pereira M A and Caspersen C J (2000) Physical activity, falls, and fractures among older adults : A Review of the Epidemiologic evidence, <i>Journal of the American Geriatrics Society</i> 48 (8) : 883-893</p>	<p>Review and synthesis of published literature to assess the relationship between physical activity and risk for falls and osteoporotic fractures among older adults.</p>	<p>Recent trials suggest that exercise, particularly involving balance and lower extremity strength training, may reduce risk of falling. There is consistent evidence from prospective and case-control studies that physical activity is associated with a 20-40% reduced risk of hip fracture relative to sedentary individuals. The few studies that have examined the association between physical activity and risk of other common osteoporotic fractures, such as vertebral and wrist fractures, have not found physical activity to be protective. Conclusions: Epidemiologic studies suggest that higher levels of leisure time physical activity prevent hip fractures and RCTs suggest certain exercise programs may reduce risk of falls.</p>

f) Lifestyle interventions – diet and nutrition, smoking cessation, motivation, leisure, life-long learning and volunteering

Study	Methods	Findings
<p>Prochaska J O, Evers K E, Castle P H, Johnson J L, Prochaska J M, Rula E Y, Coberley C and Pope J E (2012) Enhancing Multiple Domains of Well-Being by Decreasing Multiple Health Risk Behaviors: A Randomized Clinical Trial, <i>Population Health Management</i> 15 (5) : 276-286</p>	<p>A sample of 3391 individuals who reported health risk in the areas of exercise and stress management were randomly assigned to 3 groups: telephonic coaching that applied Transtheoretical Model (TTM) tailoring for exercise and minimal tailoring (stage of change) for stress management; an Internet program that applied TTM tailoring for stress management and minimal tailoring for exercise; or a control group that received an assessment only. Participants were administered the Well-Being Assessment and, at baseline, had relatively low well-being scores (mean, 60.9 out of 100 across all groups).</p>	<p>At 6 months, a significantly higher percentage of both treatment groups progressed to the Action stage for exercise, stress management, healthy diet, and total number of health risks, compared to the control group. Both treatment groups also demonstrated significantly greater improvements on overall well-being and the domains of emotional health, physical health, life evaluation, and healthy behaviors. There were no differences between the groups for 2 well-being domains: basic access to needs and work environment. These results indicate that scalable, tailored behaviour change programs can effectively reduce health risk and accrue to improved well-being for participants.</p>

<p>Nazroo J and Matthews K (2012) <i>The impact of volunteering on well-being in later life</i>, WRVS</p>	<p>Waves 2 to 4 of ELSA are used to examine the impact of volunteering on later well-being within longitudinal models. Multivariate linear regression analyses were used to examine the cross-sectional relationship with well-being for different types of volunteering (compared with non-volunteers) after adjusting for other relevant characteristics – age, marital status, physical health, socioeconomic position, etc.</p> <p>Analysis of wave 4 of ELSA (conducted over the period 2008-9) showed that just over a quarter (25.3%) of the post-state pension age (60 or older for women, 65 or older for men) population reported that they were involved in voluntary work. Of the volunteers around two thirds (66%) volunteered more than monthly, around one in seven engaged in voluntary activities approximately monthly (15%) and one in five volunteered less than monthly (19%).</p>	<p>For each of the well-being outcomes there is a strong positive effect of volunteering on subsequent well-being (the decline in the depression and social isolation scores reflect improvement, as do the increases in quality of life and life satisfaction scores), and this effect remains after adjusting for demographic factors</p> <p>Appreciated volunteers have an improvement in their well-being over time compared with non-volunteers, which is not the case for unappreciated volunteers. However, in no case is there a suggestion that unappreciated volunteers do worse than nonvolunteers.</p>
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<p>Scarborough P, Morgan R D, Webster P and Rayner M (2011) Differences in coronary heart disease, stroke and cancer mortality rates between England, Wales, Scotland and Northern Ireland: the role of diet and nutrition, <i>BMJ Open</i> 1:e000263 : doi: 10.1136/bmjopen-2011-000263</p>	<p>The aim of this study is to estimate how many deaths from CHD, stroke and cancer would be delayed or averted if Wales, Scotland and Northern Ireland adopted a diet equivalent in nutritional quality to the English diet. Mortality data for CHD, stroke and 10 diet-related cancers for 2007–2009 were used to calculate the mortality gap (the difference between actual mortality and English mortality rates) for Wales, Scotland and Northern Ireland. Estimates of mean national consumption of 10 dietary factors were used as baseline and counterfactual inputs in a macro-simulation model (DIETRON). An uncertainty analysis was conducted using a Monte Carlo simulation with 5000 iterations.</p>	<p>The mortality gap in the modelled scenario (achieving the English diet) was reduced by 81% (95% credible intervals: 62% to 108%) for Wales, 40% (33% to 51%) for Scotland and 81% (67% to 99%) for Northern Ireland, equating to approximately 3700 deaths delayed or averted annually. For CHD only, the mortality gap was reduced by 88% (69% to 118%) for Wales, 58% (47% to 72%) for Scotland, and 88% (70% to 111%) for Northern Ireland. Conclusion: Improving the average diet in Wales, Scotland and Northern Ireland to a level already achieved in England could have a substantial impact on reducing geographical variations in chronic disease mortality rates in the UK. Much of the mortality gap between Scotland and England is however explained by non-dietary risk factors.</p>
<p>Lee A H, Jancey J, Howat P, Burke L, Kerr D A and Shilton T (2011) Effectiveness of a Home-Based Postal and Telephone Physical Activity and Nutrition Pilot Program for Seniors, <i>Journal of Obesity</i> 2011 (786827) : 1-8</p>	<p>To evaluate the effectiveness of a 12-week home-based postal and telephone physical activity and nutrition pilot program for seniors. Methods. The program was delivered by mailed material and telephone calls. The main intervention consisted of a booklet tailored for seniors containing information on dietary guidelines, recommended physical activity levels, and goal setting. Dietary and walking activity outcomes were collected via a self-administered postal questionnaire pre- and post-intervention and analysed using linear mixed regressions. Of the 270 seniors recruited, half were randomly selected for the program while others served as the control group.</p>	<p>The program elicited favourable responses. Post-intervention walking for exercise/recreation showed an average gain of 27 minutes per week for the participants in contrast to an average drop of 5 minutes for the controls ($P < .01$). Little change was evident in errand walking for both groups. The intervention group ($n = 114$) demonstrated a significant increase in fibre intake ($P < .01$) but no reduction in fat intake ($P > .05$) compared to controls ($n = 134$). Conclusions. The participants became more aware of their health and wellbeing after the pilot program, which was successful in increasing time spent walking for recreation and improving fibre intake.</p>

<p>Agahi N, Silverstein M and Parker M G (2011) Late-life and earlier participation in leisure activities: Their importance for survival among older persons, <i>Activities, Adaptation & Aging</i> 35 (3) : 210-222</p>	<p>A nationally representative sample of 457 older persons was followed for 25 years with data from the Level-of-Living Survey and the SWEOLD study. To determine whether activity participation in old age is important for survival independent of one's earlier history of participation?</p>	<p>Regardless of earlier activities and health, late-life leisure engagement was associated with enhanced survival, especially among men. Among women, earlier activities (study groups) also seem important, perhaps by providing social networks. Results suggest that it is worthwhile to encourage elderly people to participate in leisure activities and to facilitate their participation in the community even at high ages.</p>
<p>Jenkins A (2011) Participation in learning and wellbeing among older adults, <i>International Journal of Lifelong Education</i> 30 (3) : 403-420</p>	<p>To identify the effects of participation in learning on the subjective wellbeing of older adults. Data were from the English Longitudinal Study of Ageing (ELSA), a large-scale, nationally representative survey of those aged 50 and above. The survey contains several wellbeing measures and information on three types of learning: formal courses, music/arts/evening classes and gym/exercise classes. Multiple regression analyses were applied to the change in wellbeing outcomes between two survey waves.</p>	<p>The key finding was that music, arts and evening classes were significantly associated with changes in each of the measures of subjective wellbeing. Formal courses and gym/exercise classes were not significantly associated with wellbeing, after controlling for other factors.</p>

<p>Taylor R and Serra V (2010) <i>Older people and functional foods: The importance of diet in supporting older people's health; what role for functional foods?</i>, London: ILC-UK</p>	<p>This paper undertook three case studies to consider whether functional foods have a role in supporting older people's health and nutrition.</p> <p>The first case study was probiotic yoghurts and drinks. The scientific literature found evidence for their effect on the body including the gastrointestinal microflora and gut related immunity. The strongest evidence of health benefits were found in preventing and treating antibiotic associated diarrhoea (AAD), a serious health problem often affecting older people and to a lesser extent for digestive discomfort and other gastrointestinal complaints.</p> <p>The second case study looks at plant sterol and stanol containing functional foods, for which there is solid scientific data and approved health claims that 2g per day can lower Low Density Lipid (LDL) ("bad") cholesterol and total cholesterol by on average 10%. Given that older people are at greater risk of cardiovascular disease and high cholesterol is a major risk factor, cholesterol-lowering functional foods present a strong case for being included in many older people's diets as part of a healthy lifestyle approach instead of or accompanying statins.</p> <p>The third case study looked at the nutrients calcium and vitamin D, which are essential to bone health, a key concern for older people, especially postmenopausal women. There is also growing evidence for the role of vitamin D in immune health. Many older people experience calcium and particularly vitamin D deficiencies and current UK recommended daily amounts seem in need of revision in the light of current nutritional science. There is as yet no concrete answer as to how best older people should achieve increased intakes of calcium and vitamin D, although functional (fortified) foods could clearly play a role.</p>
<p>Porsdal V, Beal C, Kleivenes O K, Martinsen E W, Lindström E, Nilsson H and Svanborg P (2010) The Scandinavian Solutions for Wellness study - a two-arm observational study on the effectiveness of lifestyle intervention on subjective well-being and weight among persons with psychiatric disorders., <i>BMC Psychiatry</i> 10 (42)</p>	<p>See 'Wellness Interventions'</p>

<p>Cummings S M, Cooper R L and Cassie K M (2009) Motivational interviewing to affect behavioral change in older adults., <i>Research on Social Work Practice</i> 19 (2) : 195-204</p>	<p>Fifteen randomised controlled trials, including three from the UK, are reviewed and provide preliminary evidence for the benefits of motivational interviewing as a technique for promoting physical activity, improved diet, weight loss, smoking cessation and other factors related to better health in later life. Eligible studies were randomised controlled trials conducted using samples with an average age of over 50. Fifteen studies met the inclusion criteria.</p>	<p>Authors' conclusions The evidence base on motivational interviewing as a way of encouraging sustained behaviour change is limited and 'the studies reviewed produced conflicting results'. This may be because of differences in the amount of treatment delivered and the specific intervention model applied in different studies. Nonetheless, motivational interviewing has been found to produce significant changes in areas of significance to the health of older people.</p>
<p>Martins R K and McNeil D W (2009) Review of Motivational Interviewing in promoting health behaviors, <i>Clinical Psychology Review</i> 29 (4) : 283-293</p>	<p>Summarises and critically reviews the research in three emerging areas in which (MI) is being applied: diet and exercise, diabetes, and oral health. Overall, 37 articles were reviewed: 24 in the areas of diet and exercise, 9 in the area of diabetes, and 4 in the oral health area.</p>	<p>Research in these areas suggests that (MI) is effective in all these health domains.</p>

<p>Agahi N and Parker M G (2008) Leisure activities and mortality: Does gender matter?, <i>Journal of Ageing and Health</i> 20 (7) : 855-871</p>	<p>This study examines the association between participation in leisure activities and mortality risk among older men and women. Methods: A representative sample of 1,246 men and women ages 65 to 95, interviewed in 1991-1992, were followed for 12 years.</p>	<p>Participating in only a few activities doubled mortality risk compared to those with the highest participation levels, even after controlling for age, education, walking ability, and other health indicators. Women had a dose-response relationship between overall participation and survival. Strong associations with survival were found for engagement in organizational activities and study circles among women and hobby activities and gardening among men. Results suggest gender differences in the association between leisure activities and mortality. Women display a decreasing mortality risk for each additional activity. Social activities have the strongest effects on survival among women, whereas men seem to benefit from solitary activities.</p>
<p>Casiday R, Kinsman E, Fisher C and Bamba C (2008) <i>Volunteering and health: What impact does it really have?</i>, Volunteering England</p>	<p>A systematic review was undertaken to ascertain the health effects of volunteering on volunteers and health service users. 24,966 articles were identified from database searches, of which 87 papers were included.</p>	<p>The review identified qualified evidence that volunteering can deliver health benefits both to volunteers and to health service users. Volunteering was shown to decrease mortality and to improve self-rated health, mental health, life satisfaction, social interaction, healthy behaviours and coping ability. Volunteering can increase volunteers' longevity, improve their mental health, keep them fitter, and enable them to cope better with illness when it occurs. Volunteering also has a positive impact on a range of factors affecting health service users including their self-esteem, disease management, adoption of healthy behaviours, compliance with medical treatment and relationships with health care professionals.</p>

<p>Lang I, Rice N, Wallace R, Guralnik J and Melzer D (2007) Smoking cessation and transition into retirement: analyses from the English Longitudinal Study of Ageing, <i>Age and Ageing</i> 36 (6) : 638-643</p>	<p>A population-based prospective cohort study in England to assess whether transition into retirement is associated with increased rates of smoking cessation.</p> <p>Participants: one thousand seven hundred and twelve smokers aged 50 years and over, followed up for 5 to 6 years.</p> <p>Measurements: work status (working/retired) and smoking status (non-smoker/smoker) at baseline and follow-up.</p> <p>At baseline, 381 (22.2%) of respondents had retired, 444 (25.9%) were working and remained in work at follow-up, and 167 (9.8%) transitioned from work to retirement. Seven hundred and twenty (42.1%) had some other status (e.g. unpaid work/unemployment).</p>	<p>A total of 42.5% (95% CI 34.9–50.1) of those who retired quit smoking; for those remaining in employment this figure was 29.3% (95% CI 25.0–33.6), and for those already retired it was 30.2% (95% CI 25.5–34.9). In adjusted regression analyses, those aged 55–70 who retired were more than twice as likely (fully adjusted odds ratio 2.50 (95% CI 1.35–4.62)) to quit smoking as those who continued to work. Results were robust when those who retired for reasons of ill-health were excluded.</p> <p>Conclusions: the results suggest individuals who undergo the transition into retirement are more likely to quit smoking than those who do not. Interventions should be developed to specifically target those who are retiring, or soon to retire, and those who are due to retire should be helped to incorporate smoking cessation into their retirement planning.</p>
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<p>Pomerleau J, Lock K, Knai C, and McKee M (2005) Interventions Designed to Increase Adult Fruit and Vegetable Intake Can Be Effective: A Systematic Review of the Literature, <i>The American Society for Nutritional Sciences</i> 135 (10) : 2486-2495</p>	<p>This project systematically reviewed evidence on the effectiveness of interventions and programs promoting fruit and/or vegetable intake in adults. Forty-four studies (mainly from developed countries) were included in the review and stratified by study setting.</p>	<p>Larger effects were generally observed in individuals with pre-existing health disorders. In primary prevention interventions in healthy adults, fruit and vegetable intake was increased by ~0.1–1.4 serving/d. Consistent positive effects were seen in studies involving face-to-face education or counselling, but interventions using telephone contacts or computer-tailored information appeared to be a reasonable alternative. Community-based multi-component interventions also had positive findings. This review suggests that small increases in fruit and vegetable intake are possible in population subgroups, and that these can be achieved by a variety of approaches.</p>
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<p>Rubak S, Sandbæk A, Lauritzen T and Christensen B (2005) Motivational interviewing: a systematic review and meta-analysis, <i>British Journal of General Practice</i> 55 : 305-312</p>	<p>A systematic review and meta-analysis of randomised controlled trials using motivational interviewing as the intervention. Asystematic literature search in 16 databases produced 72 randomised controlled trials A generic inverse variance meta-analysis was performed.</p>	<p>Meta-analysis showed a significant effect (95% confidence interval) for motivational interviewing for combined effect estimates for body mass index, total blood cholesterol, systolic blood pressure, blood alcohol concentration and standard ethanol content, while combined effect estimates for cigarettes per day and for HbA1c were not significant. Motivational interviewing had a significant and clinically relevant effect in approximately three out of four studies, with an equal effect on physiological (72%) and psychological (75%) diseases. Psychologists and physicians obtained an effect in approximately 80% of the studies, while other healthcare providers obtained an effect in 46% of the studies. When using motivational interviewing in brief encounters of 15 minutes, 64% of the studies showed an effect. More than one encounter with the patient ensures the effectiveness of motivational interviewing.</p> <p>Conclusion: Motivational interviewing in a scientific setting outperforms traditional advice giving in the treatment of a broad range of behavioural problems and diseases.</p>
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g) Medical interventions – preventive medication, immunisation and screening

Study	Methods	Findings
<p>Rothwell P M, Fowkes F G R, Belch J FF, Ogawa H, Warlow C P and Meade T W (2011) Effect of daily aspirin on long-term risk of death due to cancer: Analysis of individual patient data from randomised trials, <i>The Lancet</i> 377 (9759) : 31-41</p>	<p>A study of deaths due to cancer during and after randomised trials of daily aspirin versus control done originally for prevention of vascular events. Individual patient data from all randomised trials of daily aspirin versus no aspirin with mean duration of scheduled trial treatment of 4 years or longer to determine the effect of allocation to aspirin on risk of cancer death in relation to scheduled duration of trial treatment for gastrointestinal and non-gastrointestinal cancers. In three large UK trials, long-term post-trial follow-up of individual patients was obtained from death certificates and cancer registries.</p> <p>In eight eligible trials (25 570 patients, 674 cancer deaths), allocation to aspirin reduced death due to cancer (pooled odds ratio [OR] 0.79, 95% CI 0.68—0.92, p=0.003).</p> <p>On analysis of individual patient data, which were available from seven trials (23 535 patients, 657 cancer deaths), benefit was apparent only after 5 years' follow-up (all cancers, hazard ratio [HR] 0.66, 0.50—0.87; gastrointestinal cancers, 0.46, 0.27—0.77; both p=0.003).</p>	<p>The 20-year risk of cancer death (1634 deaths in 12 659 patients in three trials) remained lower in the aspirin groups than in the control groups (all solid cancers, HR 0.80, 0.72—0.88, p<0.0001; gastrointestinal cancers, 0.65, 0.54—0.78, p<0.0001), and benefit increased (interaction p=0.01) with scheduled duration of trial treatment (=7.5 years: all solid cancers, 0.69, 0.54—0.88, p=0.003; gastrointestinal cancers, 0.41, 0.26—0.66, p=0.0001). The latent period before an effect on deaths was about 5 years for oesophageal, pancreatic, brain, and lung cancer, but was more delayed for stomach, colorectal, and prostate cancer. For lung and oesophageal cancer, benefit was confined to adenocarcinomas, and the overall effect on 20-year risk of cancer death was greatest for adenocarcinomas (HR 0.66, 0.56—0.77, p<0.0001). Benefit was unrelated to aspirin dose (75 mg upwards), sex, or smoking, but increased with age—the absolute reduction in 20-year risk of cancer death reaching 7.08% (2.42—11.74) at age 65 years and older. Daily aspirin reduced deaths due to several common cancers during and after the trials. Benefit increased with duration of treatment and was consistent across the different study populations.</p>

<p>Hellquist B N, Duffy S W, Abdsaleh S, Björnelid L, Bordás P, Tabár L, Viták B, Zackrisson S, Nyström L and Jonsson H (2011) Effectiveness of population-based service screening with mammography for women ages 40 to 49 years, <i>Cancer</i> 117 (4) : 714-722</p>	<p>The effectiveness of mammography screening for women ages 40 to 49 years still is questioned, and few studies of the effectiveness of service screening for this age group have been conducted. Breast cancer mortality was compared between women who were invited to service screening at ages 40 to 49 years (study group) and women in the same age group who were not invited during 1986 to 2005 (control group). Together, these women comprise the Mammography Screening of Young Women (SCRY) cohort, which includes all Swedish counties. A pre-screening period was defined to facilitate a comparison of mortality in the absence of screening. The outcome measure was refined mortality, ie, breast cancer death for women who were diagnosed during follow-up at ages 40 to 49 years. Relative risks (RRs) with 95% confidence intervals (CIs) were estimated.</p>	<p>There was no significant difference in breast cancer mortality during the prescreening period. During the study period, there were 803 breast cancer deaths in the study group (7.3 million person-years) and 1238 breast cancer deaths in the control group (8.8 million person-years). The average follow-up was 16 years. The estimated RR for women who were invited to screening was 0.74 (95% CI, 0.66-0.83), and the RR for women who attended screening was 0.71 (95% CI, 0.62-0.80). Conclusions: In this comprehensive study, mammography screening for women ages 40 to 49 years was efficient for reducing breast cancer mortality.</p>
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<p>Pitman R J, White L J and Sculphera M (2011) Estimating the clinical impact of introducing paediatric influenza vaccination in England and Wales ?, <i>Vaccine</i> December</p>	<p>This study examines the population impact of implementing a programme of paediatric vaccination. A dynamic transmission model was used to simulate the impact of vaccination programmes with varying levels of coverage across pre-school and school age children. These analyses suggest that vaccinating as few as 50% of 2–18 year olds could result in a substantial reduction in the annual incidence of influenza related morbidity and mortality across the population. Herd immunity may extend this protection to the young and the elderly. It is assumed that such programmes would be implemented in concert with the current strategy of vaccinating the elderly and younger at risk groups with an inactivated vaccine.</p>	<p>In England and Wales, paediatric vaccination of two to eighteen year olds reduced the estimated number of general practice consultations, hospitalisations and deaths arising from influenza A and B infections by up to 95%. This translates into an annual average reduction of approximately 52,000, 1500 and 1200 events, respectively.</p> <p>A policy of paediatric vaccination could significantly reduce the clinical burden of influenza in England and Wales, in all age groups, with the added value of herd immunity helping to protect the young and the elderly who are at highest risk of complications.</p>
<p>Michel J-P and Lang P O (2011) Promoting life course vaccination, <i>Rejuvenation Research</i> 14 (1) : 75-81</p>	<p>This study outlines the impact of vaccines on the burden of common infectious diseases and considers the negative clinical impact of VPDs in the unvaccinated population.</p>	<p>Vaccine uptake is associated with a reduction in the burden of VPDs at any age of life, due to herd immunity. Disability-free and healthy aging is closely linked to childhood health and medical conditions in young adulthood. The midlife vaccine gap drastically impacts health in later life, especially in unvaccinated and older populations. These arguments underline the need for a preventive lifelong health perspective from childhood through old age.</p>

<p>Chou R, Croswell J M, Dana T, Bougatsos C, Blazina I, Fu R, Gleitsmann K, Koenig Helen C, Lam C, Maltz A, Bruin Ruggie J, and Lin K (2011) Screening for Prostate Cancer: A Review of the Evidence for the U.S. Preventive Services Task Force, <i>Annals of Internal Medicine</i> 155 (11) : 762-771</p>	<p>To update the 2002 and 2008 U.S. Preventive Services Task Force evidence reviews on screening and treatments for prostate cancer.</p> <p>A review of randomized trials of prostate-specific antigen–based screening, randomized trials and cohort studies of prostatectomy or radiation therapy versus watchful waiting, and large observational studies of perioperative harms.</p>	<p>Of 5 screening trials, the 2 largest and highest-quality studies reported conflicting results. One found that screening was associated with reduced prostate cancer–specific mortality compared with no screening in a subgroup of men aged 55 to 69 years after 9 years (relative risk, 0.80 [95% CI, 0.65 to 0.98]; absolute risk reduction, 0.07 percentage point). The other found no statistically significant effect after 10 years (relative risk, 1.1 [CI, 0.80 to 1.5]). After 3 or 4 screening rounds, 12% to 13% of screened men had false-positive results.</p> <p>Serious infections or urine retention occurred after 0.5% to 1.0% of prostate biopsies.</p>
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<p>Maruyama T, Taguchi O, Niederman M S, Morser J, Kobayashi H, Kobayashi T, D'Alessandro-Gabazza C, Nakayama S, Nishikubo K, Noguchi T, Takei Y and Gabazza E C (2010) <i>Efficacy of 23-valent pneumococcal vaccine in preventing pneumonia and improving survival in nursing home residents: double blind, randomised and placebo controlled trial</i>, 340 : doi: 10.1136/bmj.c1004</p>	<p>To determine the efficacy of a 23-valent pneumococcal polysaccharide vaccine in people at high risk of pneumococcal pneumonia. A prospective, randomised, placebo controlled double blind study of 1006 nursing home residents in nursing homes in Japan.</p> <p>Interventions Participants were randomly allocated to either 23-valent pneumococcal polysaccharide vaccine (n=502) or placebo (n=504).</p> <p>Main outcome measures The primary end points were the incidence of all cause pneumonia and pneumococcal pneumonia. Secondary end points were deaths from pneumococcal pneumonia, all cause pneumonia, and other causes.</p>	<p>Pneumonia occurred in 63 (12.5%) participants in the vaccine group and 104 (20.6%) in the placebo group. Pneumococcal pneumonia was diagnosed in 14 (2.8%) participants in the vaccine group and 37 (7.3%) in the placebo group (P<0.001). All cause pneumonia and pneumococcal pneumonia were significantly more frequent in the placebo group than in the vaccine group: incidence per 1000 person years 55 v 91 (P<0.0006) and 12 v 32 (P<0.001), respectively. Death from pneumococcal pneumonia was significantly higher in the placebo group than in the vaccine group (35.1% (13/37) v 0% (0/14), P<0.01). The death rate from all cause pneumonia (vaccine group 20.6% (13/63) v placebo group 25.0% (26/104), P=0.5) and from other causes (vaccine group 17.7% (89/502) v placebo group (80/504) 15.9%, P=0.4) did not differ between the two study groups.</p> <p>Conclusion The 23-valent pneumococcal polysaccharide vaccine prevented pneumococcal pneumonia and reduced mortality from pneumococcal pneumonia in nursing home residents.</p>
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<p>Hol L, van Leerdam M E, van Ballegooijen M, van Vuuren A J, van Dekken H, Reijerink J C I Y, van der Toet A C M, Habbema J D F and Kuipers E J (2010) Screening for colorectal cancer: randomised trial comparing guaiac-based and immunochemical faecal occult blood testing and flexible sigmoidoscopy, <i>Gut</i> 59 (1) : 62-66</p>	<p>A randomised trial comparing participation and detection rates (DR) per screenee of guaiac-based faecal occult blood test (gFOBT), immunochemical FOBT (FIT), and flexible sigmoidoscopy (FS) for CRC screening.</p> <p>A representative sample of the Dutch population (n = 15,011), aged 50–74 years, was 1:1:1 randomised prior to invitation to one of the three screening strategies. Colonoscopy was indicated for screenees with a positive gFOBT or FIT, and for those in whom FS revealed a polyp with a diameter at least 10 mm; adenoma with at least 25% villous component or high grade dysplasia; serrated adenoma; at least 3 adenomas; at least 20 hyperplastic polyps; or CRC.</p> <p>The participation rate was 49.5% (95% confidence interval (CI) 48.1 to 50.9%) for gFOBT, 61.5% (CI, 60.1 to 62.9%) for FIT and 32.4% (CI, 31.1 to 33.7%) for FS screening. gFOBT was positive in 2.8%, FIT in 4.8% and FS in 10.2%.</p>	<p>The DR of advanced neoplasia was significantly higher in the FIT (2.4%; OR, 2.0; CI, 1.3 to 3.1) and the FS arm (8.0%; OR, 7.0; CI, 4.6 to 10.7) than the gFOBT arm (1.1%). FS demonstrated a higher diagnostic yield of advanced neoplasia per 100 invitees (2.4; CI, 2.0 to 2.8) than gFOBT (0.6; CI, 0.4 to 0.8) or FIT (1.5; CI, 1.2 to 1.9) screening.</p> <p>Conclusion: This randomised population-based CRC-screening trial demonstrated superior participation and detection rates for FIT compared to gFOBT screening. FIT screening should therefore be strongly preferred over gFOBT screening. FS screening demonstrated a higher diagnostic yield per 100 invitees than both FOBTs.</p>
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<p>Baigent C, Blackwell L, Collins R, Emberson J, Godwin J, Peto R, Buring J, Hennekens C, Kearney P, Meade T, Patrono C, Roncaglioni M C and Zanchetti A (2009) Aspirin in the primary and secondary prevention of vascular disease: collaborative meta-analysis of individual participant data from randomised trials., <i>Lancet</i> May 30;373 (9678) : 1849-1860</p>	<p>Low-dose aspirin is of definite and substantial net benefit for many people who already have occlusive vascular disease. This study assessed the benefits and risks in primary prevention using a meta-analysis of serious vascular events (myocardial infarction, stroke, or vascular death) and major bleeds in six primary prevention trials (95,000 individuals at low average risk, 660,000 person-years, 3554 serious vascular events) and 16 secondary prevention trials (17,000 individuals at high average risk, 43,000 person-years, 3306 serious vascular events) that compared long-term aspirin versus control. They report intention-to-treat analyses of first events during the scheduled treatment period.</p>	<p>In the primary prevention trials, aspirin allocation yielded a 12% proportional reduction in serious vascular events (0.51% aspirin vs 0.57% control per year, $p=0.0001$), due mainly to a reduction of about a fifth in non-fatal myocardial infarction (0.18%vs 0.23% per year, $p<0.0001$). The net effect on stroke was not significant (0.20%vs 0.21% per year, $p=0.4$): haemorrhagic stroke 0.04%vs 0.03%, $p=0.05$; other stroke 0.16%vs 0.18% per year, $p=0.08$). Vascular mortality did not differ significantly (0.19%vs 0.19% per year, $p=0.7$). Aspirin allocation increased major gastrointestinal and extracranial bleeds (0.10%vs 0.07% per year, $p<0.0001$), and the main risk factors for coronary disease were also risk factors for bleeding. In the secondary prevention trials, aspirin allocation yielded a greater absolute reduction in serious vascular events (6.7%vs 8.2% per year, $p<0.0001$), with a non-significant increase in haemorrhagic stroke but reductions of about a fifth in total stroke (2.08%vs 2.54% per year, $p=0.002$) and in coronary events (4.3%vs 5.3% per year, $p<0.0001$). In both primary and secondary prevention trials, the proportional reductions in the aggregate of all serious vascular events seemed similar for men and women.</p> <p>Summary: In primary prevention without previous disease, aspirin is of uncertain net value as the reduction in occlusive events needs to be weighed against any increase in major bleeds.</p>
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<p>Stamatakis E, Hamer M and Primatesta P (2009) Cardiovascular medication, physical activity and mortality: cross-sectional population study with ongoing mortality follow up, <i>Heart</i> 95 : 448-453</p>	<p>Cross-sectional surveys in 1998 and 2003 with ongoing mortality follow up to establish physical activity levels in relation to cardiovascular medication and to examine if physical activity is associated with benefit independently of medication among individuals with no diagnosis of cardiovascular disease (CVD).</p> <p>Participants: Population samples of adults aged 35 and over living in households, respondents of the Scottish Health Survey and the Health Survey for England.</p> <p>Main outcome measure: Moderate to vigorous physical activity (MVPA) levels and CVD mortality.</p>	<p>Fifteen percent (N=3,116) of the 20,177 respondents (8,791 men); were prescribed at least one cardiovascular medication. Medicated respondents were less likely than those unmedicated to meet the physical activity recommendations (OR:0.89, 95%CI: 0.81 to 0.99, p=0.028). The mean follow up (SD) was 6.6 (2.3) years. There were 1,509 any-cause deaths and 427 CVD deaths. Increased physical activity was associated with all-cause and CVD mortality among both un-medicated (all-cause mortality HR for those with .150 min/wk of MVPA compared with those who reported no MVPA): 0.58, 95%CI: 0.48 to 0.69, p<0.001) ; CVD mortality: 0.65, 0.46 to 0.91, p=0.036) and medicated respondents (all-cause death: 0.54, 0.40 to 0.72, p<0.001; CVD death: 0.46 (0.27 to 0.78, p=0.008).</p> <p>Conclusions: Although physical activity protects against premature mortality among both medicated and unmedicated adults, cardiovascular medication is linked with lower uptake of health enhancing physical activity. These results highlight the importance of physical activity in the primary prevention of CVD over and above medication.</p>
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<p>Huss A, Scott P, Stuck A E, Trotter C and Egger M (2009) Efficacy of pneumococcal vaccination in adults: a meta-analysis, <i>Canadian Medical Association Journal (CMAJ)</i> 180 (1) : doi: 10.1503/cmaj.080734</p>	<p>Clinical trials and meta-analyses have produced conflicting results of the efficacy of unconjugated pneumococcal polysaccharide vaccine in adults. The study sought to evaluate the vaccine's efficacy on clinical outcomes as well as the methodological quality of the trials.</p> <p>The study included 22 trials involving 101,507 participants: 11 trials reported on presumptive pneumococcal pneumonia, 19 on all-cause pneumonia and 12 on all-cause mortality. The current 23-valent vaccine was used in 8 trials.</p>	<p>The relative risk (RR) was 0.64 (95% confidence interval [CI] 0.43–0.96) for presumptive pneumococcal pneumonia and 0.73 (95% CI 0.56–0.94) for all-cause pneumonia. There was significant heterogeneity between the trials reporting on presumptive pneumonia ($I^2 = 74\%$, $p < 0.001$) and between those reporting on all-cause pneumonia ($I^2 = 90\%$, $p < 0.001$). The RR for all-cause mortality was 0.97 (95% CI 0.87–1.09), with moderate heterogeneity between trials ($I^2 = 44\%$, $p = 0.053$).</p> <p>Trial quality, especially regarding double blinding, explained a substantial proportion of the heterogeneity in the trials reporting on presumptive pneumonia and all-cause pneumonia. There was little evidence of vaccine protection in trials of higher methodological quality (RR 1.20, 95% CI 0.75–1.92, for presumptive pneumonia; and 1.19, 95% CI 0.95–1.49, for all-cause pneumonia in double-blind trials; p for heterogeneity > 0.05).</p> <p>The results for all-cause mortality in double-blind trials were similar to those in all trials combined. There was little evidence of vaccine protection among elderly patients or adults with chronic illness in analyses of all trials (RR 1.04, 95% CI 0.78–1.38, for presumptive pneumococcal pneumonia; 0.89, 95% CI 0.69–1.14, for all-cause pneumonia; and 1.00, 95% CI 0.87–1.14, for all-cause mortality).</p> <p>Interpretation: Pneumococcal vaccination does not appear to be effective in preventing pneumonia, even in populations for whom the vaccine is currently recommended.</p>
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<p>Thompson S G, Ashton H A, Gao and Scott R A P on behalf of the Multicentre Aneurysm Screening Study Group (2009) Screening men for abdominal aortic aneurysm: 10 year mortality and cost effectiveness results from the randomised Multicentre Aneurysm Screening Study, <i>BMJ</i> 338 : b2307</p>	<p>A randomised trial with 10 years of follow-up to assess whether the mortality benefit from screening men aged 65-74 for abdominal aortic aneurysm decreases over time, and to estimate the long term cost effectiveness of screening.</p> <p>Participants A population based sample of 67,770 men aged 65-74 at four centres in the UK. Screening and surveillance was delivered mainly in primary care settings, with follow-up and surgery offered in hospitals.</p> <p>Interventions Participants were individually allocated to invitation to ultrasound screening (invited group) or to a control group not offered screening. Patients with an abdominal aortic aneurysm detected at screening underwent surveillance and were offered surgery if they met predefined criteria.</p> <p>Main outcome measures Mortality and costs related to abdominal aortic aneurysm, and cost per life year gained.</p>	<p>Over 10 years 155 deaths related to abdominal aortic aneurysm (absolute risk 0.46%) occurred in the invited group and 296 (0.87%) in the control group (relative risk reduction 48%, 95% confidence interval 37% to 57%). The degree of benefit seen in earlier years of follow-up was maintained in later years. Based on the 10 year trial data, the incremental cost per man invited to screening was £100 (95% confidence interval £82 to £118), leading to an incremental cost effectiveness ratio of £7600 (£5100 to £13?000) per life year gained. However, the incidence of ruptured abdominal aortic aneurysms in those originally screened as normal increased noticeably after eight years.</p> <p>Conclusions The mortality benefit of screening men aged 65-74 for abdominal aortic aneurysm is maintained up to 10 years and cost effectiveness becomes more favourable over time.</p>
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<p>Stevenson M, Lloyd-Jones M and Papaioannou D (2009) Vitamin K to prevent fractures in older women: Systematic review and economic evaluation, <i>Health Technology Assessment</i> 13 (45) : 14pp</p>	<p>To determine the clinical effectiveness and cost-effectiveness of vitamin K in preventing osteoporotic fractures in postmenopausal women compared with either no vitamin K or specific drugs licensed in the UK for the prevention or treatment of postmenopausal osteoporosis. Relevant outcome measures included incident vertebral and non-vertebral fractures; healthrelated quality of life; all-cause mortality; and adverse effects of treatment. Only randomised controlled trials (RCTs) that reported fracture outcomes were included in the review of clinical effectiveness; however, this criterion was relaxed for consideration of adverse events, allowing inclusion of observational studies or RCTs that did not report fracture outcomes.</p>	<p>Phylloquinone was associated with a statistically significant reduction in the risk of clinical fractures relative to placebo [relative risk (RR) 0.46, 95% confidence interval (CI) 0.22 to 0.99]; morphometric vertebral fractures were not reported. Although the smaller trials found that menatetrenone was associated with a reduction in the risk of morphometric vertebral fractures relative to no treatment or calcium, the much larger OF study found no evidence of a reduction in vertebral fracture risk. The three smaller trials found no significant difference between treatment groups in non-vertebral fracture incidence.</p>
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<p>Ward S, Lloyd Jones M, Pandor A, Holmes M, Ara R, Ryan A, Yeo W and Payne N (2007) A systematic review and economic evaluation of statins for the prevention of coronary events, <i>Health Technology Assessment</i> 11 (14) : 6pp</p>	<p>Thirty-one randomised studies were identified that compared a statin with placebo or with another statin, and that reported clinical outcomes. Meta-analysis of the available data from the placebo-controlled studies indicates that, in patients with, or at risk of, CVD, statin therapy is associated with a reduced relative risk of all-cause mortality, cardiovascular mortality, CHD mortality and fatal MI, but not of fatal stroke. It is also associated with a reduced relative risk of morbidity (non-fatal stroke, non-fatal MI, TIA, unstable angina) and of coronary revascularisation. It is hardly possible, on the evidence available from the placebo-controlled trials, to differentiate between the clinical efficacy of atorvastatin, fluvastatin, pravastatin and simvastatin. However, there is some evidence from direct comparisons between statins to suggest that atorvastatin may be more effective than pravastatin in patients with symptomatic CHD.</p>	<p>There is no evidence from randomised controlled trials (RCTs) for the effectiveness of the 10-mg over-the-counter dose of simvastatin in preventing clinical events. Although there is RCT evidence to suggest that rosuvastatin is more effective than atorvastatin, pravastatin and simvastatin in reducing both total and low-density lipoprotein cholesterol, it is not possible to prove that these reductions translate into comparable reductions in clinical events. There is limited evidence for the effectiveness of statins in different subgroups. There is no evidence that statins differ in their effectiveness, measured in terms of relative risk reduction, in primary compared with secondary prevention, in women compared with men at a similar level of cardiovascular risk, in people with diabetes compared with those without, or in people aged 65 and over compared with those younger than 65. In renal transplant patients, statin therapy is associated with a reduced risk of CHD death or non-fatal MI. However, no benefit has been demonstrated in cardiac transplant patients.</p>
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<p>Nordin J, Mullooly J, Poblete S, Strikas R, Petrucci R, Wei F, Rush B, Safirstein B, Wheeler D and Nichol K L (2001) Influenza Vaccine Effectiveness in Preventing Hospitalizations and Deaths in Persons 65 Years or Older in Minnesota, New York, and Oregon: Data from 3 Health Plans, <i>Journal of Infectious Diseases</i> 184 (6) : 655-670</p>	<p>This study developed methods and determined the impact of influenza vaccination on elderly persons in 3 large health plans: Kaiser Permanente Northwest, HealthPartners, and Oxford Health Plans. Data for the 1996–1997 and 1997–1998 seasons were extracted from administrative databases. Subjects were health plan members at least 65 years old. Co-morbid conditions collected from the preceding year were used for risk adjustment with logistic regression.</p>	<p>The virus-vaccine match was excellent for year 1 and fair for year 2. Both years, during peak and total periods, vaccination reduced all causes of death and hospitalization for pneumonia and influenza: hospitalizations were reduced by 19%–20% and 18%–24% for years 1 and 2, respectively, and deaths were reduced by 60%–61% and 35%–39% for the same periods. These results show that all elderly persons should be immunized annually for influenza. The methods used in this study are an efficient cost-effective way to study vaccine impact and similar questions</p>
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h) Physical activity – walking, cycling and swimming

Study	Methods	Findings
<p>Pfaff J J, Alfonso H, Newton R U, Sim M, Flicker L and Almeida O P (2014) ACTIVEDEP: a randomised, controlled trial of a home-based exercise intervention to alleviate depression in middle-aged and older adults, <i>British Journal of Sports Medicine</i> 48 : 226-232</p>	<p>Prospective, two group parallel, randomised controlled study.</p> <p>Patients 200 adults aged 50 years or older deemed to be currently suffering from a clinical depressive illness and under the care of a general practitioner.</p> <p>Interventions Participants were randomly allocated to either usual medical care alone (control) or usual medical care plus physical activity (intervention). The intervention consisted of a 12-week home-based programme to promote physical activity at a level that meets recently published guidelines for exercise in people aged 65 years or over.</p> <p>Main outcome measurements: Severity of depression was measured with the structured interview guide for the Montgomery-Asberg Depression Rating Scale (SIGMA), and depression status was assessed with the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I).</p>	<p>Remission of depressive illness was similar in both the usual care (59%) and exercise groups (63%; OR = 1.18, 95% CI 0.61 to 2.30) at the end of the 12-week intervention, and again at the 52-week follow-up (67% vs 68%) (OR=1.07, 95% CI 0.56 to 2.02). There was no change in objective measures of fitness over the 12-week intervention among the exercise group.</p> <p>Conclusions This home-based physical activity intervention failed to enhance fitness and did not ameliorate depressive symptoms in older adults, possibly due to a lack of ongoing supervision to ensure compliance and optimal engagement.</p>

<p>Garrett S, Raina E C, Rose S B, O'Dea D, Lawton B and Dowell A C (2011) Are physical activity interventions in primary care and the community cost-effective? A systematic review of the evidence, <i>British Journal of General Practice</i> 61 (584) : e125-e133</p>	<p>To assess the cost-effectiveness of physical activity interventions in primary care and the community - a systematic review of cost-effectiveness studies based on randomised controlled trials of interventions to increase adult physical activity that were based in primary health care or the community, completed between 2002 and 2009.</p> <p>Cost-effectiveness ratios for moving one person from inactive to active, and cost-utility ratios (cost per quality-adjusted life-year [QALY]) were compared between interventions.</p> <p>Thirteen studies fulfilled the inclusion criteria. Eight studies were of good or excellent quality. Interventions, study populations, and study designs were heterogeneous, making comparisons difficult.</p>	<p>The cost to move one person to the 'active' category at 12 months was estimated for four interventions ranging from €331 to €3,673. The cost-utility was estimated in nine studies, and varied from €348 to €86,877 per QALY.</p> <p>Conclusion: Most interventions to increase physical activity were cost-effective, especially where direct supervision or instruction was not required. Walking, exercise groups, or brief exercise advice on prescription delivered in person, or by phone or mail appeared to be more cost-effective than supervised gym-based exercise classes or instructor-led walking programmes. Many physical activity interventions had similar cost-utility estimates to funded pharmaceutical interventions and should be considered for funding at a similar level.</p>
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<p>Sabia S, Dugravot A, Kivimaki M, Brunner E, Shipley M J and Singh-Manoux A (2011) Effect of intensity and type of physical activity on mortality: Results from the Whitehall II cohort study, Published ahead of print (September 2011) as 10.2105/AJPH.2011.300257 <i>American Journal of Public Health</i></p>	<p>To examine the association of intensity and type of physical activity with mortality. Methods. The duration of physical activity by intensity level and type in 7,456 men and women from the Whitehall II Study was assessed by questionnaire in 1997–1999 (mean \pmSD age = 55.9 \pm6.0 years) and 5 years later. All-cause mortality was assessed until April 2009.</p>	<p>A total of 317 participants died during the mean follow-up of 9.6 years (SD = 2.7). Reporting at least 1 hour per week of moderate activity was associated with a 33% (95% confidence interval [CI] = 14%, 45%) lower risk of mortality compared with less than 1 hour. For all physical activity types examined, except housework, a duration of physical activity greater than 0 (= 3.5 hours for walking) was associated with lower mortality in age-adjusted analyses, but only the associations with sports (hazard ratio [HR] = 0.71; 95% CI = 0.56, 0.91) and do-it-yourself activity (HR = 0.68; 95% CI = 0.53, 0.98) remained in fully adjusted analyses.</p> <p>Conclusions. It is important to consider both intensity and type of physical activity when examining associations with mortality.</p>
<p>Lee A H, Jancey J, Howat P, Burke L, Kerr D A and Shilton T (2011) Effectiveness of a Home-Based Postal and Telephone Physical Activity and Nutrition Pilot Program for Seniors, <i>Journal of Obesity</i> 2011 (786827) : 1-8</p>	<p>See Lifestyle Interventions</p>	

<p>Oja P, Titze S, Bauman A, de Geus B, Krenn P, Reger-Nash B and Kohlberger T (2011) Health benefits of cycling: a systematic review, <i>Scandinavian Journal of Medicine & Science in Sports</i> 21 (4) : 496-509</p>	<p>The purpose of this study was to update the evidence on the health benefits of cycling. A systematic review of the literature resulted in 16 cycling-specific studies.</p> <p>Cross-sectional and longitudinal studies showed a clear positive relationship between cycling and cardio-respiratory fitness in youths.</p> <p>Prospective observational studies demonstrated a strong inverse relationship between commuter cycling and all-cause mortality, cancer mortality, and cancer morbidity among middle-aged to elderly subjects.</p> <p>Intervention studies among working-age adults indicated consistent improvements in cardiovascular fitness and some improvements in cardiovascular risk factors due to commuting cycling.</p> <p>Six studies showed a consistent positive dose–response gradient between the amount of cycling and the health benefits.</p> <p>Systematic assessment of the quality of the studies showed most of them to be of moderate to high quality. According to standard criteria used primarily for the assessment of clinical studies, the strength of this evidence was strong for fitness benefits, moderate for benefits in cardiovascular risk factors, and inconclusive for all-cause mortality, coronary heart disease morbidity and mortality, cancer risk, and overweight and obesity.</p> <p>The evidence reinforces the current efforts to promote cycling as an important contributor for better population health.</p>	
<p>Hrobonova E, Breeze E and Fletcher A E (2011) Higher levels and intensity of physical activity are associated with reduced mortality among community dwelling older people, <i>Journal of Aging Research</i> ID 651931</p>	<p>People aged 75–84 years (n = 1449) participating in a randomized trial of health screening in UK general practice were interviewed about their physical activity (PA) and were assessed for a wide range of health and social problems. Mortality data were collected over 7 years of follow-up.</p>	<p>Full information on PA and potential confounders was available in 946 people. Those in the highest third of duration of PA had a lower mortality, confounder-adjusted Hazard Ratio (HR) = 0.74, and 95% Confidence Interval (CI) 0.56–0.97, compared to the lowest third. Similar benefits were seen when categorized by intensity of PA, with those in the highest group having a lower mortality, confounder-adjusted HR = 0.61, and 95% CI 0.47–0.79, compared to the lowest category.</p> <p>Conclusions. Results suggest the importance of providing older people with opportunities for physical activity.</p>

<p>Äijö M (2011) Independent and Combined Association of Physical Activity and Cardiac Disease on Mortality Risk in the Very Old, <i>Journal of Aging and Health</i> 23 (1) : 70-85</p>	<p>This study investigated physical activity as a predictor of all-cause mortality among 75- and 80-year-old people with and without chronic cardiac disease over a 10-year follow-up period. Using the Evergreen Project data, four study groups were formed according to the respondent's self-reported level of physical activity as well as chronic cardiac diseases: active without cardiac disease (control group = ANCD), active with cardiac disease (ACD), sedentary without cardiac disease (SNCD), and sedentary with cardiac disease (SCD).</p>	<p>In the analyses, the ACD (HR 1.69, 95% CI 1.02-2.81) and the SNCD (1.76, 1.14-2.73) groups had almost one and a half times greater risk of dying than the control group, while the SCD group had almost three times (2.77, 1.80-4.26) greater risk of dying than the control group. Discussion: Among the older people with cardiac disease, a physically active lifestyle was associated with lower mortality.</p>
<p>Woodcock J, Franco O H, Orsini N and Roberts I (2011) Non-vigorous physical activity and all-cause mortality: Systematic review and meta-analysis of cohort studies, <i>International Journal of Epidemiology</i> 40 (1) : 121-138</p>	<p>This systematic review and meta-analysis quantified the dose–response relationship of non-vigorous physical activity and all-cause mortality.</p>	<p>The review identified 22 studies that met the inclusion criteria, containing 977,925 (334,738 men and 643,187 women) people. There was considerable variation between the studies in their categorization of physical activity and adjustment for potential confounders. They found that 2.5 h/week (equivalent to 30 min daily of moderate intensity activity on 5 days a week) compared with no activity was associated with a reduction in mortality risk of 19% [95% confidence interval (CI) 15–24], while 7 h/week of moderate activity compared with no activity reduced the mortality risk by 24% (95% CI 19–29). They found a smaller effect in studies that looked at walking alone. Conclusion Being physically active reduces the risk of all-cause mortality. The largest benefit was found from moving from no activity to low levels of activity, but even at high levels of activity benefits accrue from additional activity.</p>

<p>Brown W J, McLaughlin D, Leung J, McCaul K A, Flicker L, Almeida O P, Hankey G J, Lopez D and Dobson A J (2011) Physical activity and all-cause mortality in older women and men, <i>British Journal of Sports Medicine</i> doi:10.1136/bjsports-2011-090529</p>	<p>The objective of this study was to compare relationships between physical activity and mortality in older women and men.</p> <p>The prospective cohort design involved 7080 women aged 70–75 years and 11 668 men aged 65–83 years at baseline, from two Australian cohorts – the Australian Longitudinal Study on Women's Health and the Health in Men Study. Self-reported low, moderate and vigorous intensity physical activity, socio-demographic, behavioural and health characteristics were assessed in relation to all-cause mortality from the National Death Index from 1996 to 2009; the median follow-up of 10.4 (women) and 11.5 (men) years.</p>	<p>There were 1,807 (25.5%) and 4,705 (40.3%) deaths in women and men, respectively. After adjustment for behavioural risk factors, demographic variables and self-reported health at baseline, there was an inverse dose – response relationship between physical activity and all-cause mortality.</p> <p>Compared with women and men who reported no activity, there were statistically significant lower hazard ratios for women who reported any activity and for men who reported activities equivalent to at least 300 metabolic equivalent.min/week. Risk reductions were 30–50% greater in women than in men in every physical activity category.</p> <p>Conclusions Physical activity is inversely associated with all-cause mortality in older men and women. The relationship is stronger in women than in men, and there are benefits from even low levels of activity.</p>
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<p>Stephana Y, Boicheb J, Trouillouda D, Derochec T and Sarrazina P (2011) The relation between risk perceptions and physical activity among older adults: A prospective study, <i>Psychology & Health</i> 26 (7) : 887-897</p>	<p>Risk perceptions of suffering from diseases may play an important role in the development of intentions to perform physical activity (PA). According to the behaviour motivation hypothesis, perceived risk could be positively and directly related to PA, but this possibility has been ignored and/or underestimated. The purpose of the present study was to examine the risk-perceptions-PA relationship among older adults. Participants (N = 143) aged from 61 to 70 years initially underwent measurement of risk perceptions, baseline PA, socio-demographic and health factors. Six months later, they were asked about their PA participation</p>	<p>Perceived risk of suffering from diseases and conditions without regular PA participation was an independent positive predictor of later PA, over and beyond baseline behaviour, socio-demographic and health variables.</p>
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<p>Cox K L, Burke V, Beilin L J and Puddey I B (2010) A comparison of the effects of swimming and walking on body weight, fat distribution, lipids, glucose, and insulin in older women: The sedentary women exercise adherence trial 2, <i>Metabolism: Clinical and Experimental</i> 59 (11) : 1562-1573</p>	<p>The aim of the study was to compare the effects of swimming and walking on fitness, body weight, lipids, glucose, and insulin in older women. Sedentary women aged 50 to 70 years (N = 116), randomly assigned to swimming or walking plus usual care or a behavioral intervention, completed 3 sessions per week of moderate-intensity exercise, supervised for 6 months then unsupervised for 6 months</p>	<p>After 6 months, 1.6-km walk time decreased in walkers and swimmers, with greater improvement in walkers (1.0 vs 0.6 minute, P =.001). In swimmers, but not walkers, distance swum in 12 minutes increased (78.1 vs -2.2 m, P =.021). Waist and hip circumferences (80.8 vs 83.1 cm and 101.8 vs 102.4 cm; P =.023 and P =.042, respectively) and insulin area under the curve (oral glucose tolerance test) (5128 vs 5623 μU/[L 120 min], P <.05) were lower with swimming. Lipids did not differ between groups.</p> <p>At 12 months, fitness was maintained. Relative to walking, swimming reduced body weight by (1.1 kg, P =.039) and resulted in lower total and low-density lipoprotein cholesterol (0.3 and 0.2 mmol/L; P =.040 and P =.049, respectively). The magnitude of the difference in the reduction of insulin area under the curve between swimming and walking was greater at 12 months; however, the significance was attenuated (4677 vs 5240 μU/[L 120 min], P =.052).</p> <p>Compared with walking, swimming improved body weight, body fat distribution, and insulin in the short term and, in the longer term, body weight and lipid measures.</p>
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<p>Smith P J, Blumenthal J A, Hoffman B M, Cooper H, Strauman T A, Welsh-Bohmer K, Browndyke J and Sherwood A (2010) Aerobic Exercise and Neurocognitive Performance: A Meta-Analytic Review of Randomized Controlled Trials, <i>Psychosomatic Medicine</i> 72 (3) : 239-252</p>	<p>To assess the effects of aerobic exercise training on neurocognitive performance. Although the effects of exercise on neurocognition have been the subject of several previous reviews and meta-analyses, they have been hampered by methodological shortcomings and are now outdated as a result of the recent publication of several large-scale, randomized, controlled trials (RCTs).</p> <p>The authors conducted a systematic literature review of RCTs examining the association between aerobic exercise training on neurocognitive performance between January 1966 and July 2009. Suitable studies were selected for inclusion according to the following criteria: randomized treatment allocation; mean age =18 years of age; duration of treatment >1 month; incorporated aerobic exercise components; supervised exercise training; the presence of a nonaerobic-exercise control group; and sufficient information to derive effect size data.</p> <p>Twenty-nine studies met inclusion criteria and were included in the analyses, representing data from 2049 participants and 234 effect sizes.</p>	<p>Individuals randomly assigned to receive aerobic exercise training demonstrated modest improvements in attention and processing speed (g = 0.158; 95% confidence interval [CI]; 0.055–0.260; p = .003), executive function (g = 0.123; 95% CI, 0.021–0.225; p = .018), and memory (g = 0.128; 95% CI, 0.015–0.241; p = .026).</p> <p>Conclusions: Aerobic exercise training is associated with modest improvements in attention and processing speed, executive function, and memory, although the effects of exercise on working memory are less consistent.</p>
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<p>Pringle A, Cooke C, Gilson N, Marsh K and McKenna J (2010) Cost-effectiveness of interventions to improve moderate physical activity: A study in nine UK sites, <i>Health Education Journal</i> 69 (2) : 211-224</p>	<p>This study measured change in moderate physical activity (MPA) in seven community-based intervention types, costs and cost-effectiveness of the interventions, and possible explanations for cost variation.</p> <p>MPA was collected using self-report measures. MPA categories (sedentary, lightly, moderately, highly active) were assigned at pre- and post-intervention. Differences between pre- and post-intervention scores identified MPA change (median metabolic equivalent (MET)-minutes/week) in completers. Cost, attendance and activity data were combined to estimate the average monthly implementation cost, cost per participant attending interventions, and the cost per completer improving MPA category. An economic model was built to estimate the cost per Quality Adjusted Life Year (QALY) gained and potential savings to the National Health Service (NHS). A wide range of physical activity interventions were assessed. They were grouped into campaigns, exercise classes, exercise referrals (for patients with health problems), motivational interviews, outdoor activity, peer-monitoring, and leader training interventions. They were conducted in locations of high health need, in nine UK primary health care trusts. Testing occurred before and after the intervention, over varied durations, to estimate the changes in activity.</p>	<p>The mean monthly costs to the NHS ranged from £504 for exercise classes to £9,227 for exercise referrals. Campaigns ranged from £745 to £1,809, exercise classes from £504 to £6,387, exercise referrals from £648 to £9,227, motivational interviews from £1,216 to £4,429, outdoor activity from £1,211 to £1,729, peer-mentoring from £637 to £1,969, and training physical leaders from £1,030 to £1,302. The cost per participant attending the interventions ranged from £55 to £3,420. The cost per completer who improved by at least one activity level ranged from £260 to £2,786.</p> <p>The cost per QALY gained from the interventions ranged from £47 (motivational interviews) to £509 (exercise referral), with this range being below the £20,000 per QALY threshold.</p> <p>Conclusion: Motivational Interviewing (MI) is the most cost effective intervention to improve moderate physical activity when measured by QALY gain.</p>
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<p>Conn V S (2010) Depressive Symptom Outcomes of Physical Activity Interventions: Meta-analysis Findings, <i>Annals of Behavioral Medicine</i> 39 (2) : 128-138</p>	<p>This meta-analysis synthesized depressive symptom outcomes of supervised and unsupervised PA interventions among healthy adults. Comprehensive searching and coding were applied to PA interventions among adults without clinical depression. Analyses included random-effects standardized means, Q, and moderator analysis using analysis of variance and regression meta-analytic analogues.</p>	<p>Treatment versus control comparisons yielded a standardized mean effect size of 0.372 among 38 supervised PA studies and 0.522 among 22 unsupervised PA studies. Preliminary moderator analyses suggested that supervised PA interventions may be more effective when they include flexibility/resistance and low-intensity exercise. Unsupervised PA interventions may be more effective when they recommend centre-based PA. Methodological moderators (random assignment, control group management) were identified. Conclusions: These findings document that PA interventions reduce depressive symptoms even in adults without clinical depression.</p>
<p>de Hartog J J, Boogaard H, Nijland H and Hoek G (2010) Do the health benefits of cycling outweigh the risks?, <i>Environmental Health Perspectives</i> 118 (8) : 1109-1116</p>	<p>This study assesses whether the health benefits from the increased physical activity of a modal shift for urban commutes outweigh the health risks. The authors summarise the literature for air pollution, traffic accidents, and physical activity using systematic reviews supplemented with recent key studies. They then quantify the impact on all-cause mortality when 500,000 people would make a transition from car to bicycle for short trips on a daily basis in the Netherlands. They express mortality impacts in life-years gained or lost, using life table calculations.</p>	<p>The beneficial effects of increased physical activity are substantially larger (3–14 months gained) than the potential mortality effect of increased inhaled air pollution doses (0.8–40 days lost) and the increase in traffic accidents (5–9 days lost). Societal benefits are even larger because of a modest reduction in air pollution and greenhouse gas emissions and traffic accidents. Conclusions: On average, the estimated health benefits of cycling are substantially larger than the risks relative to car driving for individuals shifting their mode of transport.</p>

<p>Kemmler W, von Stengel S, Engelke K, Häberle L, and Kalender W A (2010) Exercise Effects on Bone Mineral Density, Falls, Coronary Risk Factors, and Health Care Costs in Older Women: The Randomized Controlled Senior Fitness and Prevention (SEFIP) Study, <i>Archives of Internal Medicine</i> 170 (2) : 179-185</p>	<p>A randomized, single-blinded, controlled trial from May 1, 2005, through July 31, 2008, recruiting women 65 years or older who were living independently in the area of Erlangen-Nuremberg, Germany, to determine whether a single exercise program affects fracture risk (bone mineral density [BMD] and falls), coronary heart disease (CHD) risk factors, and health care costs in community-dwelling elderly women.</p> <p>In all, 246 women were randomly assigned to an 18-month exercise program (exercise group) or a wellness program (control group). The exercise group (n = 123) performed a multipurpose exercise program with special emphasis on exercise intensity; the controls (n = 123) focused on well-being with a low-intensity, low-frequency program. The main outcome measures were BMD, the number of falls, the Framingham-based 10-year CHD risk, and direct health care costs.</p>	<p>For the 227 women who completed the 18-month study, significant exercise effects were observed for BMD of the lumbar spine (mean [95% confidence interval (CI)] percentage of change in BMD [baseline to follow-up] for the exercise group: 1.77% [1.26% to 2.28%] vs controls: 0.33% [-0.24% to 0.91%]; P < .001), femoral neck (exercise group: 1.01% [0.37% to 1.65%] vs controls: -1.05% [-1.70% to -0.40%]; P < .001), and fall rate per person during 18 months (exercise group: 1.00 [0.76 to 1.24] vs controls: 1.66 [1.33 to 1.99]; P = .002). The 10-year CHD risk was significantly affected in both subgroups (absolute change for the exercise group: -1.96% [95% CI, -2.69% to -1.23%] vs controls: -1.15% [-1.69% to -0.62%]; P = .22), with no significant difference between the groups.</p> <p>The direct health care costs per participant during the 18-month intervention showed non-significant differences between the groups (exercise group: €2255 [95% CI, €1791-€2718] vs controls: €2780 [€2187-€3372]; P = .20).</p> <p>Conclusion: Compared with a general wellness program, this 18-month exercise program significantly improved BMD and fall risk, but not predicted CHD risk, in elderly women. This benefit occurred at no increase in direct costs.</p>
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<p>Yang L, Sahlqvist S, McMinn A, Griffin S J, and Ogilvie D (2010) Interventions to promote cycling: Systematic review, <i>BMJ</i> 341 : c5293</p>	<p>To determine what interventions are effective in promoting cycling, the size of the effects of interventions, and evidence of any associated benefits on overall physical activity or anthropometric measures. Twenty five studies (of which two were randomised controlled trials) from seven countries were included.</p>	<p>Six studies examined interventions aimed specifically at promoting cycling, of which four (an intensive individual intervention in obese women, high quality improvements to a cycle route network, and two multifaceted cycle promotion initiatives at town or city level) were found to be associated with increases in cycling. Those studies that evaluated interventions at population level reported net increases of up to 3.4 percentage points in the population prevalence of cycling or the proportion of trips made by bicycle. Conclusions Community-wide promotional activities and improving infrastructure for cycling have the potential to increase cycling by modest amounts, but further controlled evaluative studies incorporating more precise measures are required, particularly in areas without an established cycling culture</p>
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<p>Windle G, Hughes D, Linck P, Russell I and Woods B (2010) Is exercise effective in promoting mental well-being in older age? A systematic review, <i>Aging & Mental Health</i> 14 (6) : 652-669</p>	<p>A systematic review, meta-analysis, economic model to examine the clinical and cost-effectiveness of exercise and physical activity interventions on mental well-being in people aged 65+.</p> <p>The included interventions were designed for older people, targeted those who are sedentary and delivered in a community setting, primarily through a group-based approach led by trained leaders.</p>	<p>An overall effect of exercise on mental well-being was found (standardised effect size = 0.27; CI = 0.14-0.40).</p> <p>As a minimum, the evidence would suggest two exercise sessions per week, each of 45 min duration. There is some indication that exercise can also improve the mental well-being of frail older people. Economic evidence indicated incremental cost-effectiveness ratios (compared with minimal intervention) of 7300 and 12,100 per quality adjusted life year gained for community-based walking and exercise programmes, respectively.</p> <p>Conclusions: Mental well-being in later life is modifiable through exercise and physical activity.</p>
<p>Aarsland D, Sardaheae F S and Anderssen S (2010) Is physical activity a potential preventive factor for vascular dementia? - A systematic review, Taylor & Francis, May 2010 <i>Aging & Mental Health</i> 14 (4) : 386-395</p>	<p>A total of 24 longitudinal studies, including 1378 patients with VaD, were included in the review.</p>	<p>The majority of individual studies did not report significant associations. Five studies fulfilled criteria for meta-analysis, including 10,108 non-demented control subjects and 374 individuals with VaD. The meta-analysis demonstrated a significant association between physical exercise and a reduced risk of developing VaD: OR 0.62 (95% CI 0.42-0.92). The authors conclude that there is evidence supporting the hypothesis that physical activity is likely to prevent the development of VaD, and should be highlighted as part of secondary prevention programmes in people at risk for cerebrovascular disease.</p>

<p>Ross A and Thomas S (2010) The health benefits of yoga and exercise: A review of comparison studies, <i>The journal of alternative and complementary medicine</i> 16 (1) : 3-12</p>	<p>See Alternative Group Therapies</p>	
<p>Stamatakis E, Hamer M and Primatesta P (2009) Cardiovascular medication, physical activity and mortality: cross-sectional population study with ongoing mortality follow up, <i>Heart</i> 95 : 448-453</p>	<p>See Medical Interventions</p>	
<p>Stamatakis E, Hamer M and Lawlor D A (2009) Physical activity, mortality, and cardiovascular disease: is domestic physical activity beneficial? The Scottish Health Survey - 1995, 1998, and 2003., <i>American Journal of Epidemiology</i> 169 (10) : 1191-1200</p>	<p>The authors used data from the 1995, 1998, and 2003 Scottish Health Survey samples and the associated mortality and hospital episode records to determine the independent effects of Intense domestic physical activity (IDPA) on cardiovascular disease (CVD) events and all-cause mortality. The sample comprised 13,726 (6,102 men) CVD-free respondents (> or =35 years). Multivariable survival analysis assessed the relation between IDPA and the risk for CVD (fatal/nonfatal combined) or all-cause mortality. During 8.4 (standard deviation, 3.4) years of follow-up, there were 1,103 deaths (573 among men) and 890 CVD events (521 among men).</p>	<p>Participation in IDPA was associated with lower all-cause mortality (men: relative risk = 0.68, 95% confidence interval: 0.50, 0.91; women: relative risk = 0.70, 95% confidence interval: 0.52, 0.93). In both sexes, IDPA was unrelated to the risk for CVD. Total physical activity (including IDPA) was unrelated to fatal/nonfatal CVD, but when domestic activity was excluded from the calculations there was an association (men: relative risk = 0.76, 95% confidence interval: 0.58, 0.98; women: relative risk = 0.68, 95% confidence interval: 0.50, 0.93). These results indicate that IDPA may not offer protection against CVD, but it may protect against all-cause mortality. CVD preventive efforts may need to focus on moderate-to-vigorous-intensity physical activities other than those performed in and around the household.</p>
<p>Keogh J W L, Kilding A, Pidgeon P, Ashley L and Gillis D (2009) Physical benefits of dancing for healthy older adults: A review, <i>Journal of Aging and Physical Activity</i> 17 : 1-23</p>	<p>See Arts and Music</p>	

<p>Boone-Heinonen J, Evenson K R, Taber D R and Gordon-Larsen P (2009) Walking for prevention of cardiovascular disease in men and women: a systematic review of observational studies, <i>Obesity Reviews</i> 10 (1) : 204-217</p>	<p>In this systematic review, walking (a generally accessible activity for a largely sedentary population) was assessed as a preventive risk factor for development of fatal and non-fatal cardiovascular disease (CVD). Because functional status may be an important determinant of walking behaviour in adults, potential bias due to pre-existing illness is of concern in all studies reviewed, particularly in case-control studies which ascertain walking retrospectively and yield the strongest associations.</p>	<p>Generally, there were dose-dependent reductions in CVD risk with higher walking duration, distance, energy expenditure and pace. Associations appeared to be stronger for ischaemic stroke than other CVD outcomes such as coronary heart disease or haemorrhagic stroke. Adjustment for clinical CVD risk factors, obesity or other types of physical activity generally attenuated but did not eliminate associations.</p>
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<p>Lautenschlager N T, Cox K L, Flicker L, Foster J K, van Bockxmeer F M, Xiao J, Greenop K R and Almeida O P (2008) Effect of Physical Activity on Cognitive Function in Older Adults at Risk for Alzheimer Disease, <i>Journal of the American Medical Association</i> 300 (9) : 1027-1037</p>	<p>To determine whether physical activity reduces the rate of cognitive decline among older adults at risk. A randomized controlled trial of a 24-week physical activity intervention conducted between 2004 and 2007 in metropolitan Perth, Western Australia. Assessors of cognitive function were blinded to group membership. Participants: Volunteers who reported memory problems but did not meet criteria for dementia. Three hundred eleven individuals aged 50 years or older were screened for eligibility, 89 were not eligible, and 52 refused to participate. A total of 170 participants were randomized and 138 participants completed the 18-month assessment. Participants were randomly allocated to an education and usual care group or to a 24-week home-based program of physical activity. Main Outcome Measure: Change in Alzheimer Disease Assessment Scale–Cognitive Subscale (ADAS-Cog) scores (possible range, 0-70) over 18 months.</p>	<p>In an intent-to-treat analysis, participants in the intervention group improved 0.26 points (95% confidence interval, -0.89 to 0.54) and those in the usual care group deteriorated 1.04 points (95% confidence interval, 0.32 to 1.82) on the ADAS-Cog at the end of the intervention. The absolute difference of the outcome measure between the intervention and control groups was -1.3 points (95% confidence interval, -2.38 to -0.22) at the end of the intervention. At 18 months, participants in the intervention group improved 0.73 points (95% confidence interval, -1.27 to 0.03) on the ADAS-Cog, and those in the usual care group improved 0.04 points (95% confidence interval, -0.46 to 0.88). Word list delayed recall and Clinical Dementia Rating sum of boxes improved modestly as well, whereas word list total immediate recall, digit symbol coding, verbal fluency, Beck depression score, and Medical Outcomes 36-Item Short-Form physical and mental component summaries did not change significantly. Conclusions In this study of adults with subjective memory impairment, a 6-month program of physical activity provided a modest improvement in cognition over an 18-month follow-up period.</p>
<p>Sherrington C, Whitney J C, Lord S R, Herbert R D, Cumming R G and Close J C T (2008) Effective Exercise for the Prevention of Falls: A Systematic Review and Meta-Analysis, <i>Journal of the American Geriatrics Society</i> 56 (12) : 2234-2243</p>	<p>See Falls Prevention</p>	

<p>Müller-Riemenschneider F, Reinholda T, Nocona M and Willich S N (2008) Long-term effectiveness of interventions promoting physical activity: A systematic review, <i>Preventive Medicine</i> 47 (4) : 354-368</p>	<p>This systematic review aims to evaluate the long-term effectiveness of physical activity interventions targeted at healthy adults and to identify effective intervention components. Of 5508 identified publications 25 studies met the inclusion criteria. There was substantial heterogeneity in study quality, intervention strategies and intervention effects</p>	<p>Compared to no-intervention and minimal-intervention control, gains in weekly energy expenditure and physical fitness of up to 975 kcal and 11% were achieved, respectively. Booster interventions were used in 16 studies. Conclusions: There is evidence for long-term increases in physical activity behaviour and physical fitness. To improve uptake of physical activity additional tailored exercise prescription strategies seem promising. Booster interventions such as phone, mail or internet can help to facilitate long-term effectiveness.</p>
<p>Hamer M and Chida Y (2008) Walking and primary prevention; a meta-analysis of prospective cohort studies, <i>British Journal of Sports Medicine</i> 42 : 238-243</p>	<p>To quantify the association between walking and the risk of cardiovascular disease (CVD) and all-cause mortality in healthy men and women. Study selection: Prospective epidemiological studies of walking and CVD and all-cause mortality 18 prospective studies were included in the overall analysis, which incorporated 459 833 participants free from CVD at baseline with 19 249 cases at follow-up.</p>	<p>From the meta-analysis the pooled hazard ratio of CVD in the highest walking category compared with the lowest was 0.69, (95% CI 0.61 to 0.77, $p < 0.001$), and 0.68 (0.59 to 0.78, $p < 0.001$) for all-cause mortality. These effects were robust among men and women, although there was evidence of publication biases for the associations with CVD risk. Walking pace was a stronger independent predictor of overall risk compared with walking volume (48% versus 26% risk reductions, respectively). There was also evidence of a dose-response relationship across the highest, intermediate, and lowest walking categories in relation to the outcome measures.</p>

<p>Bizea R, Johnson J A and Plotnikoff R C (2007) Physical activity level and health-related quality of life in the general adult population: A systematic review, <i>Preventive Medicine</i> 45 (6) : 401-415</p>	<p>The primary objective was to systematically review data examining the relationship between health-related quality of life and physical activity level in the general population. From 1426 retrieved references, 55 citations were judged to require further evaluation. Fourteen studies were retained for data extraction and analysis.</p>	<p>Cross-sectional studies showed a consistently positive association between self-reported physical activity and health-related quality of life. The largest cross-sectional study reported an adjusted odds ratio of “having 14 or more unhealthy days” during the previous month to be 0.40 (95% Confidence Interval 0.36–0.45) for those meeting recommended levels of physical activity compared to inactive subjects. Cohort studies and randomized controlled trials tended to show a positive effect of physical activity on health-related quality of life, but similar to the cross-sectional studies, had methodological limitations. Conclusion.: Cross-sectional data showed a consistently positive association between physical activity level and health-related quality of life. Limited evidence from randomized controlled trials and cohort studies precludes a definitive statement about the nature of this association.</p>
<p>Warburton D E R, Nicol C W and Bredin S S D (2006) Health benefits of physical activity: The evidence, <i>Canadian Medical Association Journal</i> 174 (6) : 801-809</p>	<p>The primary purpose of this narrative review was to evaluate the current literature and to provide further insight into the role physical inactivity plays in the development of chronic disease and premature death.</p>	<p>The authors confirm that there is irrefutable evidence of the effectiveness of regular physical activity in the primary and secondary prevention of several chronic diseases (e.g., cardiovascular disease, diabetes, cancer, hypertension, obesity, depression and osteoporosis) and premature death. There appears to be a linear relation between physical activity and health status, such that a further increase in physical activity and fitness will lead to additional improvements in health status.</p>

<p>Barnett A, Smith B, Lord S R, Williams M and Baumand A (2003) Community-based group exercise improves balance and reduces falls in at-risk older people: a randomised controlled trial, <i>Age and Ageing</i> 32 (4) : 407-414</p>	<p>See Falls Prevention</p>
<p>Gregg E W, Pereira M A and Caspersen C J (2000) Physical activity, falls, and fractures among older adults : A Review of the Epidemiologic evidence, <i>Journal of the American Geriatrics Society</i> 48 (8) : 883-893</p>	<p>See Falls Prevention</p>

i) Technology

Study	Methods	Findings
<p>Barlow J, Singh D, Bayer S and Curry R (2007) A systematic review of the benefits of home telecare for frail elderly people and those with long-term conditions, <i>Journal of Telemedicine and Telecare</i> 13 (4) : 172-179</p>	<p>Asystematic review of home telecare for frail elderly people and for patients with chronic conditions.</p> <p>Randomized controlled trials of any size and observational studies with 80 or more participants were eligible for inclusion if they examined the effects of using telecommunications technology to (a) monitor vital signs or safety and security in the home, or (b) provide information and support. The review included 68 randomized controlled trials (69%) and 30 observational studies with 80 or more participants (31%). Most studies focused on people with diabetes (31%) or heart failure (29%). Almost two-thirds (64%) of the studies originated in the US; more than half (55%) had been published within the previous three years.</p>	<p>Based on the evidence reviewed, the most effective telecare interventions appear to be automated vital signs monitoring (for reducing health service use) and telephone follow-up by nurses (for improving clinical indicators and reducing health service use). The cost-effectiveness of these interventions was less certain. There is insufficient evidence about the effects of home safety and security alert systems. It is important to note that just because there is insufficient evidence about some interventions, this does not mean that those interventions have no effect.</p>

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