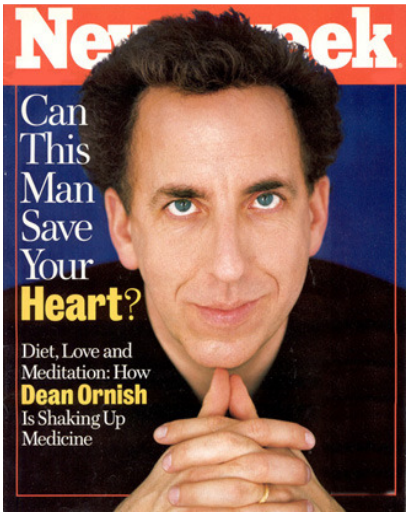
Regenerative Health Programme
Supporting evidence for programme elements

The following pages contain the latest published, peer-reviewed research that supports the core elements of the lifestyle change programme. Most papers featured can be read in full online by following the link, others might only provide a short abstract but these are very useful when browsing a topic and looking for a snapshot of results. The PubMed database, which is the largest source of published medical research, has many features that are helpful for people looking to go more in-depth; simply click on 'related citations' and you will open up a channel of alternative papers to follow, or look at the list of references at the end of papers that interest you and either follow a link to new papers or cut and paste the title into Google Scholar and pick up the trail that way.

The Integrative Health Trust has an online evidence base that is accessible to all paying members, to find out more about the charity (of which Dr Rosy Daniel is Medical Director) please contact Abi Leeder on 01225 319131 or email: info@integrativehealthtrust.org

Contents

1. Studies of Dr Dean Ornish



Dean Ornish et al. **Changes in prostate gene expression in men undergoing an intensive nutrition and lifestyle intervention.** PNAS June 17, 2008 vol. 105 no. 24 8369-8374.

Abstract

Epidemiological and prospective studies indicate that comprehensive lifestyle changes may modify the progression of prostate cancer. However, the molecular mechanisms by which improvements in diet and lifestyle might affect the prostate microenvironment are poorly understood. We conducted a pilot study to examine changes in prostate gene expression in a unique population of men with low-risk prostate cancer who declined immediate surgery, hormonal therapy, or radiation and participated in an intensive nutrition and lifestyle intervention while undergoing careful surveillance for tumor progression. Consistent with previous studies, significant improvements in weight, abdominal obesity, blood pressure, and lipid profile were observed (all $P < 0.05$), and surveillance of low-risk patients was safe. Gene expression profiles were obtained from 30 participants, pairing RNA samples from control prostate needle biopsy taken before intervention to RNA from the same patient's 3-month postintervention biopsy. Quantitative real-time PCR was used to validate array observations for selected transcripts. Two-class paired analysis of global gene expression using significance analysis of microarrays detected 48 up-regulated and 453 down-regulated transcripts after the intervention. Pathway analysis identified significant modulation of biological processes that have critical roles in tumorigenesis, including protein metabolism and modification, intracellular protein traffic, and protein phosphorylation (all $P < 0.05$). Intensive nutrition and lifestyle changes may modulate gene expression in the prostate. Understanding the prostate molecular response to comprehensive lifestyle changes may strengthen efforts to develop effective prevention and treatment. Larger clinical trials are warranted to confirm the results of this pilot study. http://www.pnas.org/content/105/24/8369.full.pdf+html

Ornish et al. **Intensive lifestyle changes may effect the progression of prostate cancer.** Journal of Urology, Vol 174, 1067-1070, 2005

Abstract

Purpose - Men with prostate cancer are often advised to make changes in diet and lifestyle, although the impact of these changes has not been well documented. Therefore, we evaluated the effects of comprehensive lifestyle changes on prostate specific antigen (PSA), treatment trends and serum stimulated LNCaP cell growth in men with early, biopsy proven prostate cancer after 1 year.

Materials and Methods - Patient recruitment was limited to men who had chosen not to undergo any conventional treatment, which provided an unusual opportunity to have a nonintervention randomized control group to avoid the confounding effects of interventions such as radiation, surgery or androgen deprivation therapy. A total of 93 volunteers with serum PSA 4 to 10 ng/ml and cancer Gleason scores less than 7 were

randomly assigned to an experimental group that was asked to make comprehensive lifestyle changes or to a usual care control group.
Results - None of the experimental group patients but 6 control patients underwent conventional treatment due to an increase in PSA and/or progression of disease on magnetic resonance imaging. PSA decreased 4% in the experimental group but increased 6% in the control group ($p = 0.016$). The growth of LNCaP prostate cancer cells (American Type Culture Collection, Manassas, Virginia) was inhibited almost 8 times more by serum from the experimental than from the control group (70% vs 9%, $p < 0.001$). Changes in serum PSA and also in LNCaP cell growth were significantly associated with the degree of change in diet and lifestyle.
Conclusions - Intensive lifestyle changes may affect the progression of early, low grade prostate cancer in men. Further studies and longer term followup are warranted.
http://www.pmri.org/publications/Lifestyle_Changes_and_Prostate_Cancer.pdf

Ornish D et al. **Intensive lifestyle changes for reversal of coronary heart disease.**
JAMA, Dec 16, 1996, Vol 280, No 23
Abstract
Context.— The Lifestyle Heart Trial demonstrated that intensive lifestyle changes may lead to regression of coronary atherosclerosis after 1 year. Objectives.— To determine the feasibility of patients to sustain intensive lifestyle changes for a total of 5 years and the effects of these lifestyle changes (without lipid-lowering drugs) on coronary heart disease. Design.— Randomized controlled trial Patients.— Forty-eight patients with moderate to severe coronary heart disease were randomized to an intensive lifestyle change group or to a usual-care control group, and 35 completed the 5-year follow-up quantitative coronary arteriography. Setting.— Two tertiary care university medical centers. Intervention.— Intensive lifestyle changes (10% fat whole foods vegetarian diet, aerobic exercise, stress management training, smoking cessation, group psychosocial support) for 5 years. Main Outcome Measures.— Adherence to intensive lifestyle changes, changes in coronary artery percent diameter stenosis, and cardiac events. Results.— Experimental group patients (20 [71%] of 28 patients completed 5-year follow-up) made and maintained comprehensive lifestyle changes for 5 years, whereas control group patients (15 [75%] of 20 patients completed 5-year follow-up) made more moderate changes. In the experimental group, the average percent diameter stenosis at baseline decreased 1.75 absolute percentage points after 1 year (a 4.5% relative improvement) and by 3.1 absolute percentage points after 5 years (a 7.9% relative improvement). In contrast, the average percent diameter stenosis in the control group increased by 2.3 percentage points after 1 year (a 5.4% relative worsening) and by 11.8 percentage points after 5 years (a 27.7% relative worsening) (P=.001 between groups. Twenty-five cardiac events occurred in 28 experimental group patients vs 45 events in 20 control group patients during the 5-year follow-up (risk ratio for any event for the control group, 2.47 [95% confidence interval, 1.48-4.20]). Conclusions.— More regression of coronary atherosclerosis occurred after 5 years than after 1 year in the experimental group. In contrast, in the control group, coronary atherosclerosis continued to progress and more than twice as many cardiac events occurred.
http://jama.ama-assn.org/content/280/23/2001.long

Claudia R. Pischke et al. **Lifestyle changes and clinical profile in coronary heart disease patients with an ejection fraction of ≤40% or >40% in the Multicenter Lifestyle Demonstration Project.** Eur J Heart Fail (2007) 9 (9): 928-934. doi: 10.1016/j.ejheart.2007.05.009

Abstract
Background: Lifestyle changes are recommended for coronary heart disease (CHD) patients at risk for heart failure (HF) [ACC/AHA stage B; left ventricular ejection fraction (LVEF)V40%]. However, it is not clear whether changes in lifestyle are feasible and beneficial in these patients.
Aim: To investigate the feasibility of intensive lifestyle changes for CHD patients at risk for HF.
Methods: We compared 50 patients (18% female) with angiographically documented LVEF≤40% (mean=33.4±7.3; range: 15–40%) to 186
patients (18% female) with LVEFN40% (mean=58.2±9.6; range: 42–87%), who were participants in the Multicenter Lifestyle Demonstration Project (MLDP). All were non-smoking CHD patients. The MLDP was a community-based, insurance-sponsored intervention (low-fat, plant-based diet; exercise; stress management) implemented at 8 sites in the US. Coronary risk factors, lifestyle and quality of life (SF-36) were assessed at baseline, 3 and 12 months.
Results: Regardless of LVEF, patients showed significant improvements (all pb.05) in lifestyle behaviours, body weight, body fat, blood pressure, resting heart rate, total and LDL-cholesterol, exercise capacity, and quality of life by 3 months; most improvements were maintained over 12 months.
Conclusion: CHD patients at risk for heart failure with an LVEFV40%, can make changes in lifestyle to achieve similar medical and psychosocial benefit to patients with an LVEFN40%.
http://eurjhf.oxfordjournals.org/content/9/9/928.full.pdf+html

Ornish D et al. **Increased telomerase activity and comprehensive lifestyle changes: a pilot study.** The Lancet Oncology, Volume 9, Issue 11, Pages 1048 - 1057, November 2008. Abstract only: a subscription is needed for full text.

Abstract
BACKGROUND: Telomeres are protective DNA-protein complexes at the end of linear chromosomes that promote chromosomal stability. Telomere shortness in human beings is emerging as a prognostic marker of disease risk, progression, and premature mortality in many types of cancer, including breast, prostate, colorectal, bladder, head and neck, lung, and renal cell. Telomere shortening is counteracted by the cellular enzyme telomerase. Lifestyle factors known to promote cancer and cardiovascular disease might also adversely affect telomerase function. However, previous studies have not addressed whether improvements in nutrition and lifestyle are associated with increases in telomerase activity. We aimed to assess whether 3 months of intensive lifestyle changes increased telomerase activity in peripheral blood mononuclear cells (PBMC).
METHODS: 30 men with biopsy-diagnosed low-risk prostate cancer were asked to make comprehensive lifestyle changes. The primary endpoint was telomerase enzymatic activity per viable cell, measured at baseline and after 3 months. 24 patients had sufficient PBMCs needed for longitudinal analysis. This study is registered on the ClinicalTrials.gov website, number NCT00739791.
FINDINGS: PBMC telomerase activity expressed as natural logarithms increased from 2.00 (SD 0.44) to 2.22 (SD 0.49; p=0.031). Raw values of telomerase increased from 8.05 (SD 3.50) standard arbitrary units to 10.38 (SD 6.01) standard arbitrary units. The

increases in telomerase activity were significantly associated with decreases in low-density lipoprotein (LDL) cholesterol (r=-0.36, p=0.041) and decreases in psychological distress (r=-0.35, p=0.047).
INTERPRETATION: Comprehensive lifestyle changes significantly increase telomerase activity and consequently telomere maintenance capacity in human immune-system cells. Given this finding and the pilot nature of this study, we report these increases in telomerase activity as a significant association rather than inferring causation. Larger randomised controlled trials are warranted to confirm the findings of this study.
http://www.ncbi.nlm.nih.gov/pubmed/18799354

Exercise and health

Pierce J et al. **Greater Survival After Breast Cancer in Physically Active Women (full title - Greater Survival After Breast Cancer in Physically Active Women With High Vegetable-Fruit Intake Regardless of Obesity).** J Clin Oncol. 2007 June 10; 25(17): 2345–2351.
Abstract - Purpose Single-variable analyses have associated physical activity, diet, and obesity with survival after breast cancer. This report investigates interactions among these variables.
Patients and Methods - A prospective study was performed of 1,490 women diagnosed and treated for early-stage breast cancer between 1991 and 2000. Enrollment was an average of 2 years postdiagnosis. Only seven women were lost to follow-up through December 2005.
Results In univariate analysis, reduced mortality was weakly associated with higher vegetable-fruit consumption, increased physical activity, and a body mass index that was neither low weight nor obese. In a multivariate Cox model, only the combination of consuming five or more daily servings of vegetables-fruits, and accumulating 540+ metabolic equivalent tasks-min/wk (equivalent to walking 30 minutes 6 d/wk), was associated with a significant survival advantage (hazard ratio, 0.56; 95% CI, 0.31 to 0.98). The approximate 50% reduction in risk associated with these healthy lifestyle behaviors was observed in both obese and nonobese women, although fewer obese women were physically active with a healthy dietary pattern (16% *v* 30%). Among those who adhered to this healthy lifestyle, there was no apparent effect of obesity on survival. The effect was stronger in women who had hormone receptor–positive cancers.
Conclusion A minority of breast cancer survivors follow a healthy lifestyle that includes both recommended intakes of vegetables-fruits and moderate levels of physical activity. The strong protective effect observed suggests a need for additional investigation of the effect of the combined influence of diet and physical activity on breast cancer survival.
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2274898/?tool=pubmed

Department of Health. **At least five a week: evidence on the impact of physical activity and its relationship to health.** A report from the Chief Medical Officer. London: The Stationery Office; 2004.

http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_4080994

Warburton D et al. **Health benefits of physical activity: the evidence.** CMAJ March 14, 2006; 174 (6).

Abstract
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. We 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. We also reveal that the current Health Canada physical activity guidelines are sufficient to elicit health benefits, especially in previously sedentary people. 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.
Physical inactivity is a modifiable risk factor for cardiovascular disease and a widening variety of other chronic diseases, including diabetes mellitus, cancer (colon and breast), obesity, hypertension, bone and joint diseases (osteoporosis and osteoarthritis), and depression. The prevalence of physical inactivity (among 51% of adult Canadians) is higher than that of all other modifiable risk factors. In this article we review the current evidence relating to physical activity in the primary and secondary prevention of premature death from any cause, cardiovascular disease, diabetes, some cancers and osteoporosis. We also discuss the evidence relating to physical fitness and musculoskeletal fitness and briefly describe the independent effects of frequency and intensity of physical activity. (A glossary of terms related to the topic appears in appendix 1). In a companion paper, to be published in the Mar. 28 issue, we will review how to evaluate the health-related physical fitness and activity levels of patients and will provide exercise recommendations for health.

Several authors have attempted to summarize the evidence in systematic reviews and meta-analyses. These evaluations are often overlapping (reviewing the same evidence). Some of the most commonly cited cohorts have been described in different studies over time as more data accumulate (see Appendix 2, available online at www.cmaj.ca/cgi/content/full/174/6/801/DC1).

Cherkas L et al. **The Association Between Physical Activity in Leisure Time and Leukocyte Telomere Length.** Arch Intern Med. 2008; 168(2):154-158.

ABSTRACT
Background Physical inactivity is an important risk factor for many aging-related diseases. Leukocyte telomere dynamics (telomere length and age-dependent attrition rate) are ostensibly a biological indicator of human aging. We therefore tested the hypothesis that physical activity level in leisure time (over the past 12 months) is associated with leukocyte telomere length (LTL) in normal healthy volunteers.
Methods We studied 2401 white twin volunteers, comprising 2152 women and 249 men, with questionnaires on physical activity level, smoking status, and socioeconomic status. Leukocyte telomere length was derived from the mean terminal restriction fragment length and adjusted for age and other potential confounders.

Results Leukocyte telomere length was positively associated with increasing physical activity level in leisure time ($P < .001$); this association remained significant after adjustment for age, sex, body mass index, smoking, socioeconomic status, and physical activity at work. The LTLs of the most active subjects were 200 nucleotides longer than those of the least active subjects (7.1 and 6.9 kilobases, respectively; $P = .006$). This finding was confirmed in a small group of twin pairs discordant for physical activity level (on average, the LTL of more active twins was 88 nucleotides longer than that of less active twins; $P = .03$).
Conclusions A sedentary lifestyle (in addition to smoking, high body mass index, and low socioeconomic status) has an effect on LTL and may accelerate the aging process. This provides a powerful message that could be used by clinicians to promote the potentially antiaging effect of regular exercise. http://archinte.ama-assn.org/cgi/content/full/168/2/154

Erickson K. **Physical activity predicts gray matter volume in late adulthood. The Cardiovascular Health Study.** Neurology October 13, 2010 WNL.0b013e3181f88359. Abstract only, subscription needed to access full article.
Abstract
Objectives: Physical activity (PA) has been hypothesized to spare gray matter volume in late adulthood, but longitudinal data testing an association has been lacking. Here we tested whether PA would be associated with greater gray matter volume after a 9-year follow-up, a threshold could be identified for the amount of walking necessary to spare gray matter volume, and greater gray matter volume associated with PA would be associated with a reduced risk for cognitive impairment 13 years after the PA evaluation.
Methods: In 299 adults (mean age 78 years) from the Cardiovascular Health Cognition Study, we examined the association between gray matter volume, PA, and cognitive impairment. Physical activity was quantified as the number of blocks walked over 1 week. High-resolution brain scans were acquired 9 years after the PA assessment on cognitively normal adults. White matter hyperintensities, ventricular grade, and other health variables at baseline were used as covariates. Clinical adjudication for cognitive impairment occurred 13 years after baseline.
Results: Walking amounts ranged from 0 to 300 blocks (mean 56.3; SD 69.7). Greater PA predicted greater volumes of frontal, occipital, entorhinal, and hippocampal regions 9 years later. Walking 72 blocks was necessary to detect increased gray matter volume but walking more than 72 blocks did not spare additional volume. Greater gray matter volume with PA reduced the risk for cognitive impairment 2-fold.
Conclusion: Greater amounts of walking are associated with greater gray matter volume, which is in turn associated with a reduced risk of cognitive impairment.
http://www.neurology.org/content/early/2010/10/13/WNL.0b013e3181f88359

Leitzmann M et al. **Physical Activity Recommendations and Decreased Risk of Mortality.** Arch Intern Med. 2007;167(22):2453-2460.
ABSTRACT
Background Whether national physical activity recommendations are related to mortality benefit is incompletely understood.
Methods We prospectively examined physical activity guidelines in relation to mortality among 252 925 women and men aged 50 to 71 years in the National Institutes of Health–American Association of Retired Persons (NIH-AARP) Diet and Health Study. Physical activity was assessed using 2 self-administered baseline questionnaires.

Results During 1 265 347 person-years of follow-up, 7900 participants died. Compared with being inactive, achievement of activity levels that approximate the recommendations for moderate activity (at least 30 minutes on most days of the week) or vigorous exercise (at least 20 minutes 3 times per week) was associated with a 27% (relative risk [RR], 0.73; 95% confidence interval [CI], 0.68-0.78) and 32% (RR, 0.68; 95% CI, 0.64-0.73) decreased mortality risk, respectively. Physical activity reflective of meeting both recommendations was related to substantially decreased mortality risk overall (RR, 0.50; 95% CI, 0.46-0.54) and in subgroups, including smokers (RR, 0.48; 95% CI, 0.44-0.53) and nonsmokers (RR, 0.54; 95% CI, 0.45-0.64), normal weight (RR, 0.45; 95% CI, 0.39-0.52) and overweight or obese individuals (RR, 0.48; 95% CI, 0.44-0.54), and those with 2 h/d (RR, 0.53; 95% CI, 0.44-0.63) and more than 2 h/d of television or video watching (RR, 0.50; 95% CI, 0.45-0.55). Engaging in physical activity at less than recommended levels was also related to reduced mortality risk (RR, 0.81; 95% CI, 0.76-0.86). Conclusions Following physical activity guidelines is associated with lower risk of death. Mortality benefit may also be achieved by engaging in less than recommended activity levels.
http://archinte.ama-assn.org/cgi/content/full/167/22/2453

Yeh GY, Roberts DH, Wayne PM, Davis RB, Quilty MT, Phillips RS. **Tai chi exercise for patients with chronic obstructive pulmonary disease: a pilot study.** Respir Care. 2010 Nov;55(11):1475-82.
OBJECTIVE: To determine the feasibility of a randomized controlled trial of the effect of a tai chi program on quality of life and exercise capacity in patients with COPD. METHODS: We random- ized 10 patients with moderate to severe COPD to 12 weeks of tai chi plus usual care (n = 5) or usual care alone (n = 5). The tai chi training consisted of a 1-hour class, twice weekly, that emphasized gentle movement, relaxation, meditation, and breathing techniques. Exploratory outcomes included disease-specific symptoms and quality-of-life, exercise capacity, pulmonary function tests, mood, and self-efficacy. We also conducted qualitative interviews to capture patient narratives regarding their experience with tai chi. RESULTS: The patients were willing to be randomized. Among 4 of the 5 patients in the intervention group, adherence to the study protocol was excellent. The cohort's baseline mean = SD age, percent-of-predicted FEV1, and ratio of FEV1 to forced vital capacity were 66 = 6 y, 50 = 12%, and 0.63 = 0.14, respectively. At 12 weeks there was significant improvement in Chronic Respiratory Questionnaire score among the tai chi participants (1.4 = 1.1), compared to the usual-care group (-0.1 = 0.4) (P =.03). There were nonsignificant trends toward improvement in 6-min walk distance (55 = 47 vs –13 = 64 m, P =.09), Center for Epidemiologic Studies Depression Scale (-9.0 = 9.1 vs -2.8 = 4.3, P = .20), and University of California, San Diego Shortness of Breath score (-7.8 = 3.5 vs -1.2 = 11, P = .40). There were no significant changes in either group's peak oxygen uptake. CONCLUSIONS: A randomized controlled trial of tai chi is feasible in patients with moderate to severe COPD. Tai chi exercise as an adjunct to standard care warrants further investigation.
http://www.rcjournal.com/contents/11.10/11.10.1475.pdf

Relaxation and Meditation

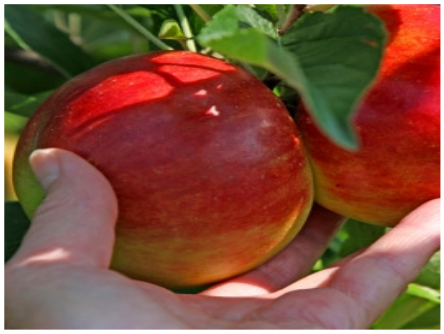
van Dixhoorn Jan, White, Adrian. **Relaxation therapy for rehabilitation and prevention in ischaemic heart disease: a systematic review and meta-analysis.** European Journal of Cardiovascular Prevention & Rehabilitation, June 2005 - Volume 12 - Issue 3 - pp 193-202.
Aims To establish the effects of relaxation therapy on the recovery from a cardiac ischaemic event and secondary prevention.
Methods and results A search was conducted for controlled trials in which patients with myocardial ischaemia were taught relaxation therapy, and outcomes were measured with respect to physiological, psychological, cardiac effects, return to work and cardiac events. A total of 27 studies were located. Six studies used abbreviated relaxation therapy (3 h or less of instruction), 13 studies used full relaxation therapy (9 h of supervised instruction and discussion), and in eight studies full relaxation therapy was expanded with cognitive therapy (11h on average). Physiological outcomes: reduction in resting heart rate, increased heart rate variability, improved exercise tolerance and increased high-density lipoprotein cholesterol were found. No effect was found on blood pressure or cholesterol. Psychological outcome: state anxiety was reduced, trait anxiety was not, depression was reduced. Cardiac effects: the frequency of occurrence of angina pectoris was reduced, the occurrence of arrhythmia and exercise induced ischaemia were reduced. Return to work was improved. Cardiac events occurred less frequently, as well as cardiac deaths. With the exception of resting heart rate, the effects were small, absent or not measured in studies in which abbreviated relaxation therapy was given. No difference was found between the effects of full or expanded relaxation therapy.
Conclusion Intensive supervised relaxation practice enhances recovery from an ischaemic cardiac event and contributes to secondary prevention. It is an important ingredient of cardiac rehabilitation, in addition to exercise and psycho- education. Eur J Cardiovasc Prev Rehabil 12:193–202 c 2005 The European Society of Cardiology
http://www.methodevandixhoorn.com/review.pdf

Fadel Zeidan, Susan K. Johnson, Nakia S. Gordon, Paula Goolkasian. **Effects of Brief and Sham Mindfulness Meditation on Mood and Cardiovascular Variables.** The Journal of Alternative and Complementary Medicine. August 2010, 16(8): 867-873. doi:10.1089/acm.2009.0321.
Abstract
Objectives: Although long-term meditation has been found to reduce negative mood and cardiovascular variables, the effects of a brief mindfulness meditation intervention when compared to a sham mindfulness meditation intervention are relatively unknown. This experiment examined whether a 3-day (1-hour total) mindfulness or sham mindfulness meditation intervention would improve mood and cardiovascular variables when compared to a control group.
Methods: Eighty-two (82) undergraduate students (34 males, 48 females), with no prior meditation experience, participated in three sessions that involved training in either

mindfulness meditation, sham mindfulness meditation, or a control group. Heart rate, blood pressure, and psychologic variables (Profile of Mood States, State Anxiety Inventory) were assessed before and after the intervention.
Results: The meditation intervention was more effective at reducing negative mood, depression, fatigue, confusion, and heart rate, when compared to the sham and control groups.
Conclusions: These results indicate that brief meditation training has beneficial effects on mood and cardiovascular variables that go beyond the demand characteristics of a sham meditation intervention.
http://www.liebertonline.com/doi/abs/10.1089/acm.2009.0321

Davidson et al. **Alterations in Brain and Immune Function Produced by Mindfulness Meditation.** Psychosomatic Medicine 65:564-570, 2003
Abstract
OBJECTIVE: The underlying changes in biological processes that are associated with reported changes in mental and physical health in response to meditation have not been systematically explored. We performed a randomized, controlled study on the effects on brain and immune function of a well-known and widely used 8-week clinical training program in mindfulness meditation applied in a work environment with healthy employees.
METHODS: We measured brain electrical activity before and immediately after, and then 4 months after an 8-week training program in mindfulness meditation. Twenty-five subjects were tested in the meditation group. A wait-list control group ($N = 16$) was tested at the same points in time as the meditators. At the end of the 8-week period, subjects in both groups were vaccinated with influenza vaccine.
RESULTS: We report for the first time significant increases in left-sided anterior activation, a pattern previously associated with positive affect, in the meditators compared with the nonmeditators. We also found significant increases in antibody titers to influenza vaccine among subjects in the meditation compared with those in the wait-list control group. Finally, the magnitude of increase in left-sided activation predicted the magnitude of antibody titer rise to the vaccine.
CONCLUSIONS: These findings demonstrate that a short program in mindfulness meditation produces demonstrable effects on brain and immune function. These findings suggest that meditation may change brain and immune function in positive ways and underscore the need for additional research.
http://www.psychosomaticmedicine.org/cgi/content/full/65/4/564

Nutritional Therapy/Healthy Eating



Diet, Nutrition, and the Prevention of Chronic Disease: Report of a joint WHO/FAO expert consultation, in WHO Technical Report Series. 2002, World Health Organisation/Food and Agriculture Organization: Geneva.
http://www.who.int/hpr/NPH/docs/who_fao_expert_report.pdf

Joshipura KJ, HU FB, Manson JE, et al (2001) **The effect of fruit and vegetable intake on risk for coronary heart disease.** Ann Intern Med 134: 1106-1114.
Background: Many constituents of fruits and vegetables may reduce the risk for coronary heart disease, but data on the rela- tionship between fruit and vegetable consumption and risk for coronary heart disease are sparse.
Objective: To evaluate the association of fruit and vegetable consumption with risk for coronary heart disease.
Design: Prospective cohort study. Setting: The Nurses' Health Study and the Health Professionals'
Follow-Up Study.
Participants: 84 251 women 34 to 59 years of age who were followed for 14 years and 42 148 men 40 to 75 years who were followed for 8 years. All were free of diagnosed cardiovascular disease, cancer, and diabetes at baseline.
Measurements: The main outcome measure was incidence of nonfatal myocardial infarction or fatal coronary heart disease (1127 cases in women and 1063 cases in men). Diet was assessed by using food-frequency questionnaires.
Results: After adjustment for standard cardiovascular risk factors, persons in the highest quintile of fruit and vegetable intake had a relative risk for coronary heart disease of 0.80 (95% CI, 0.69 to 0.93) compared with those in the lowest quintile of intake. Each 1-serving/d increase in intake of fruits or vegetables was associated with a 4% lower risk for coronary heart disease (relative risk, 0.96 [CI, 0.94 to 0.99]; P=0.01, test for trend). Green leafy vegetables (relative risk with 1-serving/d increase, 0.77 [CI, 0.64 to 0.93]), and vitamin C–rich fruits and vegetables (relative risk with 1-serving/d increase, 0.94 [CI, 0.88 to 0.99]) contributed most to the apparent protective effect of total fruit and vegetable intake.
Conclusions: Consumption of fruits and vegetables, particularly green leafy vegetables and vitamin C–rich fruits and vegetables, appears to have a protective effect against coronary heart disease.
http://www.annals.org/content/134/12/1106.full.pdf+html

Liu S, Lee IM, Ajani U, Cole SR, Buring JE, Manson JE (2001) **Intake of vegetables rich in carotenoids and risk of coronary heart disease in men: the Physicians' Health Study.** Int J Epidemiol 30: 130-135
Abstract
Background Previous studies of diet and coronary heart disease (CHD) have focused on intake of nutrients rather than whole foods. Because of the findings that dietary fibre, folate and antioxidants may be protective for CHD, increased intake of vegetables has been recommended. However, due to the chemical and physical complexity of vegetables, the effects of individual nutrients may differ if eaten as whole foods. Moreover, little is known about the direct association between vegetable intake and risk of CHD.
Methods We prospectively evaluated the relation between vegetable intake and CHD risk in the Physicians' Health Study, a randomized trial of aspirin and beta-carotene among 22 071 US male physicians aged 40–84 years in 1982. In this analysis, we included 15 220 men without heart disease, stroke or cancer at baseline who provided information on their vegetable intake at baseline, and in the 2nd, 4th and 6th years of follow-up using a simple semiquantitative food frequency questionnaire including eight vegetables. We confirmed 1148 incident cases of CHD (387 incident cases of myocardial infarction and 761 incident cases of coronary artery bypass grafting or

percutaneous transluminal coronary angioplasty) during 12 years of follow-up.
Results After adjusting for age, randomized treatment, body mass index (BMI), smoking, alcohol intake, physical activity, history of diabetes, history of hypertension, history of high cholesterol, and use of multivitamins, men who consumed at least 2.5 servings/day of vegetables had a relative risk (RR) of 0.77 (95% CI : 0.60–0.98) for CHD, compared with men in the lowest category (<1 serving/day). Adjusting for the same covariates in an analysis of the overall trend that considered intake of vegetables as a continuous variable, we found a RR of 0.83 (95% CI : 0.71–0.98) for risk of CHD for each additional serving/day of vegetables. The inverse relation between vegetable intake and CHD risk was more evident among men with a BMI ≥25 (RR = 0.71, 95% CI : 0.51–0.99) or current smokers (RR = 0.40, 95% CI : 0.18–0.86) comparing highest to the lowest categories of intake.
Conclusions Our results suggest an inverse association between vegetable intake and risk of CHD. These prospective data support current dietary guidelines to increase vegetable intake for the prevention of CHD.
http://ije.oxfordjournals.org/content/30/1/130.long

Trichopoulou A et al. **Modified Mediterranean diet and survival: EPIC-elderly prospective cohort study.** BMJ 2005; 330 : 991 doi: 10.1136/bmj.38415.644155.8F
Abstract
Objective To examine whether adherence to the modified Mediterranean diet, in which unsaturates were substituted for monounsaturates, is associated with longer life expectancy among elderly Europeans.
Design Multicentre, prospective cohort study.
Setting Nine European countries (Denmark, France, Germany, Greece, Italy, the Netherlands, Spain, Sweden, United Kingdom).
Participants 74 607 men and women, aged 60 or more, without coronary heart disease, stroke, or cancer at enrolment and with complete information about dietary intake and potentially confounding variables.
Main outcome measures Extent of adherence to a modified Mediterranean diet using a scoring system on a 10 point scale, and death from any cause by time of occurrence, modelled through Cox regression.
Results An increase in the modified Mediterranean diet score was associated with lower overall mortality, a two unit increment corresponding to a statistically significant reduction of 8% (95% confidence interval 3% to 12%). No statistically significant evidence of heterogeneity was found among countries in the association of the score with overall mortality even though the association was stronger in Greece and Spain. When dietary exposures were calibrated across countries, the reduction in mortality was 7% (1% to 12%).
Conclusion The Mediterranean diet, modified so as to apply across Europe, was associated with increased survival among older people.
http://www.bmj.com/content/330/7498/991.full

He FJ, Nowson CA, Lucas M, MacGregor GA**. Increased consumption of fruit and vegetables is related to a reduced risk of coronary heart disease: meta-analysis of cohort studies.** J Hum Hypertens. 2007 Sep;21(9):717-28. Abstract only, a subscription is needed to access full text.
Abstract
Increased consumption of fruit and vegetables has been shown to be associated with a

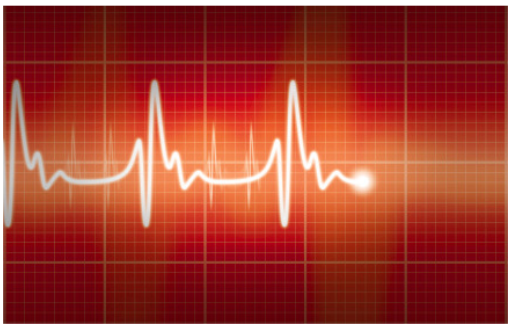
reduced risk of coronary heart disease (CHD) in many epidemiological studies, however, the extent of the association is uncertain. We quantitatively assessed the relation between fruit and vegetable intake and incidence of CHD by carrying out a meta-analysis of cohort studies. Studies were included if they reported relative risks (RRs) and corresponding 95% confidence interval (CI) of CHD with respect to frequency of fruit and vegetable intake. Twelve studies, consisting of 13 independent cohorts, met the inclusion criteria. There were 278,459 individuals (9143 CHD events) with a median follow-up of 11 years. Compared with individuals who had less than 3 servings/day of fruit and vegetables, the pooled RR of CHD was 0.93 (95% CI: 0.86-1.00, P=0.06) for those with 3-5 servings/day and 0.83 (0.77-0.89, P<0.0001) for those with more than 5 servings/day. Subgroup analyses showed that both fruits and vegetables had a significant protective effect on CHD. Our meta-analysis of prospective cohort studies demonstrates that increased consumption of fruit and vegetables from less than 3 to more than 5 servings/day is related to a 17% reduction in CHD risk, whereas increased intake to 3-5 servings/day is associated with a smaller and borderline significant reduction in CHD risk. These results provide strong support for the recommendations to consume more than 5 servings/day of fruit and vegetables.
http://www.ncbi.nlm.nih.gov/pubmed/17443205

Pereira M. et al., **Effects of a low-glycemic load diet on resting energy expenditure and heart disease risk factors during weight loss**. Journal of the American Medical Association, 2004, Vol 292: pp.2482-2490
Context Weight loss elicits physiological adaptations relating to energy intake and expenditure that antagonize ongoing weight loss.
Objective To test whether dietary composition affects the physiological adaptations to weight loss, as assessed by resting energy expenditure.
Design, Study, and Participants A randomized parallel-design study of 39 overweight or obese young adults aged 18 to 40 years who received an energy-restricted diet, either low–glycemic load or low-fat. Participants were studied in the General Clinical Research Centers of the Brigham and Women's Hospital and the Children's Hospital, Boston, Mass, before and after 10% weight loss. The study was conducted from January 4, 2001, to May 6, 2003.
Main Outcome Measures Resting energy expenditure measured in the fasting state by indirect calorimetry, body composition by dual-energy x-ray absorptiometry, cardiovascular disease risk factors, and self-reported hunger.
Results Resting energy expenditure decreased less with the low–glycemic load diet than with the low-fat diet, expressed in absolute terms (mean [SE], 96 [24] vs 176 [27] kcal/d; P = .04) or as a proportion (5.9% [1.5%] vs 10.6% [1.7%]; P = .05). Participants receiving the low–glycemic load diet reported less hunger than those receiving the low-fat diet (P = .04). Insulin resistance (P = .01), serum triglycerides (P = .01), C-reactive protein (P = .03), and blood pressure (P = .07 for both systolic and diastolic) improved more with the low–glycemic load diet. Changes in body composition (fat and lean mass) in both groups were very similar (P = .85 and P = .45, respectively).
Conclusions Changes in dietary composition within prevailing norms can affect physiological adaptations that defend body weight. Reduction in glycemic load may aid in the prevention or treatment of obesity, cardiovascular disease, and diabetes mellitus.
http://jama.ama-assn.org/content/292/20/2482.long

La Vecchia C. **Mediterranean diet and cancer.** Public Health Nutr. 2004 Oct;7(7):965-8.OBJECTIVE: To analyse the role of various aspects of the Mediterranean diet in several common epithelial cancers, including digestive and selected non-digestive tract neoplasms.
DESIGN: Systematic analysis of data from a series of case-control studies.
SUBJECTS: Over 12,000 cases of 20 cancer sites and 10,000 controls.
RESULTS: For most epithelial cancers, the risk decreased with increasing vegetable and fruit consumption, with relative risk (RR) between 0.3 and 0.7 for the highest versus the lowest tertile. For digestive tract cancers, population-attributable risks for low intake of vegetables and fruit ranged between 15 and 40%. A protective effect was observed also for breast, female genital tract, urinary tract and a few other epithelial neoplasms. A number of antioxidants and other micronutrients showed an inverse relationship with cancer risk, but the main components responsible for the favourable effect of a diet rich in vegetables and fruit remain undefined. Fish tended to be another favourable diet indicator. In contrast, subjects reporting frequent red meat intake showed RRs above unity for several common neoplasms. Intake of whole-grain foods was related to a reduced risk of several types of cancer, particularly of the upper digestive tract. This may be due to a favourable role of fibre, but the issue is still open to discussion. In contrast, refined grain intake and, consequently, glycaemic load and glycaemic index were associated with increased risk of different types of cancer including, among others, breast and colorectal.
CONCLUSIONS: A low-risk diet for cancer in the Mediterranean would imply increasing the consumption of fruit and vegetables, as well as avoiding increasing the intakes of meat and refined carbohydrates. Further, olive oil and other unsaturated fats, which are also typical aspects of the Mediterranean diet, should be preferred to saturated ones. http://www.ncbi.nlm.nih.gov/pubmed/15482626

La Vecchia C, Chatenoud L, Altieri A, Tavani A. **Nutrition and health: epidemiology of diet, cancer and cardiovascular disease in Italy.** Nutr Metab Cardiovasc Dis. 2001 Aug;11(4 Suppl):10-5.
Abstract Most epidemiological data suggest a protective role for fruits and vegetables in the prevention of several common epithelial cancers, including digestive and major non-digestive neoplasms. The relation between frequency of consumption of vegetables and fruit and cancer and myocardial infarction risk was analysed using data from a series of case-control studies conducted in Italy. For digestive tract cancer, population attributable risks for low intake of vegetables and fruit ranged between 15 and 40%. A selected number of antioxidants showed a significant inverse relation with breast and colorectal cancer risk, although the main components responsible for the favourable effect of a diet rich in vegetables and fruit remain undefined. Fish tends to be another favourable indicator of reduced cancer risk. In contrast, subjects reporting frequent red meat intake showed a relative risk consistently above unity for several common neoplasms. Whole grain food intake was consistently related to reduced risk of several types of cancer, particularly of the upper digestive tract neoplasms. Epidemiological evidence of the relation between fiber and colorectal cancer indicated a possible protections. In contrast, refined grain intake was associated to increased risk of different types of cancer, pointing to a potential role of insulin-like growth factor 1 (IGF-1). A low risk diet for cardiovascular disease includes high consumption of fish, vegetables and fruit, and hence rich in ascorbic acid and other antioxidants, thus sharing several aspects with a favourable diet for cancer. http://www.ncbi.nlm.nih.gov/pubmed/11894740

Cardiac coherence



Nolan RP, Kamath MV, Floras JS, Stanley J, Pang C, Picton P, Young QR. **Heart rate variability biofeedback as a behavioral neurocardiac intervention to enhance vagal heart rate control**.Am Heart J. 2005 Jun;149(6):1137.
Abstract: BACKGROUND: Patients with coronary heart disease (CHD) who experience depressed mood or psychological stress exhibit decreased vagal control of heart rate (HR), as assessed by spectral analysis of HR variability (HRV). Myocardial infarction and sudden cardiac death are independently associated with depression and stress, as well as impaired vagal HR control. This study examined whether a behavioral neurocardiac intervention to reduce stress or depression can augment cardiovagal modulation in CHD patients. We hypothesized that (1) cognitive-behavioral training with HRV biofeedback would augment vagal recovery from acute stress, and (2) vagal regulation of HR would be inversely associated with stress and depression after treatment.
METHODS: This randomized controlled trial enrolled 46 CHD patients from 3 clinics of CHD risk reduction in Toronto and Vancouver, Canada. Subjects were randomized to five 1.5-hour sessions of HRV biofeedback or an active control condition. Outcome was assessed by absolute and normalized high-frequency spectral components (0.15-0.50 Hz) of HRV, and by the Perceived Stress Scale and Centre for Epidemiologic Studies in Depression scale.
RESULTS: Both groups reduced symptoms on the Perceived Stress Scale (P = .001) and Centre for Epidemiologic Studies in Depression scale (P = .004). Hierarchical linear regression determined that improved psychological adjustment was significantly associated with the high-frequency index of vagal HR modulation only in the HRV biofeedback group. Adjusted R 2 was as follows: HRV biofeedback group, 0.86 for stress (P = .02) and 0.81 for depression (P = .03); versus the active control group, 0.04 (P = .57) and 0.13 (P = .95), respectively. CONCLUSION: A novel behavioral neurocardiac intervention, HRV biofeedback, can augment vagal HR regulation while facilitating psychological adjustment to CHD.
http://www.ncbi.nlm.nih.gov/pubmed/15976804/

Nolan RP, Floras JS, Harvey PJ, Kamath MV, Picton PE, Chessex C, Hiscock N, Powell J, Catt M, Hendrickx H, Talbot D, Chen MH. **Behavioral neurocardiac training in hypertension: a randomized, controlled trial.**Hypertension. 2010 Apr;55(4):1033-9. Epub 2010 Mar 1.
Abstract It is not established whether behavioral interventions add benefit to pharmacological therapy for hypertension. We hypothesized that behavioral neurocardiac training (BNT) with heart rate variability biofeedback would reduce blood pressure further by modifying vagal heart rate modulation during reactivity and recovery from standardized cognitive tasks ("mental stress"). This randomized, controlled trial enrolled 65 patients with uncomplicated hypertension to BNT or active control (autogenic relaxation), with six 1-hour sessions over 2 months with home practice. Outcomes were analyzed with linear mixed models that adjusted for antihypertensive drugs. BNT

reduced daytime and 24-hour systolic blood pressures (–2.4±0.9 mm Hg, P=0.009, and –2.1±0.9 mm Hg, P=0.03, respectively) and pulse pressures (–1.7±0.6 mm Hg, P=0.004, and –1.4±0.6 mm Hg, P=0.02, respectively). No effect was observed for controls (P>0.10 for all indices). BNT also increased RR-high-frequency power (0.15 to 0.40 Hz; P=0.01) and RR interval (P<0.001) during cognitive tasks. Among controls, high-frequency power was unchanged (P=0.29), and RR interval decreased (P=0.03). Neither intervention altered spontaneous baroreflex sensitivity (P>0.10). In contrast to relaxation therapy, BNT with heart rate variability biofeedback modestly lowers ambulatory blood pressure during wakefulness, and it augments tonic vagal heart rate modulation. It is unknown whether efficacy of this treatment can be improved with biofeedback of baroreflex gain. BNT, alone or as an adjunct to drug therapy, may represent a promising new intervention for hypertension.
http://hyper.ahajournals.org/cgi/content/full/55/4/1033

Joseph CN, Porta C, Casucci G, Casiraghi N, Maffeis M, Rossi M, Bernardi L. **Slow breathing improves arterial baroreflex sensitivity and decreases blood pressure in essential hypertension.** Hypertension. 2005 Oct;46(4):714-8. Epub 2005 Aug 29.
Sympathetic hyperactivity and parasympathetic withdrawal may cause and sustain hypertension. This autonomic imbalance is in turn related to a reduced or reset arterial baroreflex sensitivity and chemoreflex-induced hyperventilation. Slow breathing at 6 breaths/min increases baroreflex sensitivity and reduces sympathetic activity and chemoreflex activation, suggesting a potentially beneficial effect in hypertension. We tested whether slow breathing was capable of modifying blood pressure in hypertensive and control subjects and improving baroreflex sensitivity. Continuous noninvasive blood pressure, RR interval, respiration, and end-tidal CO_2 (CO_2-et) were monitored in 20 subjects with essential hypertension (56.4±1.9 years) and in 26 controls (52.3±1.4 years) in sitting position during spontaneous breathing and controlled breathing at slower (6/min) and faster (15/min) breathing rate. Baroreflex sensitivity was measured by autoregressive spectral analysis and "alpha angle" method. Slow breathing decreased systolic and diastolic pressures in hypertensive subjects (from 149.7±3.7 to 141.1±4 mm Hg, *P*<0.05; and from 82.7±3 to 77.8±3.7 mm Hg, *P*<0.01, respectively). Controlled breathing (15/min) decreased systolic (to 142.8±3.9 mm Hg; *P*<0.05) but not diastolic blood pressure and decreased RR interval (*P*<0.05) without altering the baroreflex. Similar findings were seen in controls for RR interval. Slow breathing increased baroreflex sensitivity in hypertensives (from 5.8±0.7 to 10.3±2.0 ms/mm Hg; *P*<0.01) and controls (from 10.9±1.0 to 16.0±1.5 ms/mm Hg; *P*<0.001) without inducing hyperventilation. During spontaneous breathing, hypertensive subjects showed lower CO_2 and faster breathing rate, suggesting hyperventilation and reduced baroreflex sensitivity (*P*<0.001 versus controls). Slow breathing reduces blood pressure and enhances baroreflex sensitivity in hypertensive patients. These effects appear potentially beneficial in the management of hypertension.
http://hyper.ahajournals.org/cgi/content/full/46/4/714

Kimberly S. Swanson, Richard N. Gevirtz, Milton Brown, James Spira, Ermina Guarneri and Liset Stoletniy **The Effect of Biofeedback on Function in Patients with Heart Failure.** Applied Psychophysiology and Biofeedback, Volume 34, Number 2, 71-91, DOI: 10.1007/s10484-009-9077-2
Abstract
Decreased HRV has been consistently associated with increased cardiac mortality and

morbidity in HF patients. The aim of this study is to determine if a 6-week course of heart rate variability (HRV) biofeedback and breathing retraining could increase exercise tolerance, HRV, and quality of life in patients with New York Heart Association Class I-III heart failure (HF). Participants (N = 29) were randomly assigned to either the treatment group consisting of six sessions of breathing retraining, HRV biofeedback and daily practice, or the comparison group consisting of six sessions of quasi-false alpha-theta biofeedback and daily practice. Exercise tolerance, measured by the 6-min walk test (6MWT), HRV, measured by the standard deviation of normal of normal beats (SDNN), and quality of life, measured by the Minnesota Living with Congestive Heart Failure Questionnaire, were measured baseline (week 0), post (week 6), and follow-up (week 18). Cardiorespiratory biofeedback significantly increased exercise tolerance ($p = .05$) for the treatment group in the high (≥31%) left ventricular ejection fraction (LVEF) category between baseline and follow-up. Neither a significant difference in SDNN ($p = .09$) nor quality of life ($p = .08$), was found between baseline and follow-up. A combination of HRV biofeedback and breathing retraining may improve exercise tolerance in patients with HF with an LVEF of 31% or higher. Because exercise tolerance is considered a strong prognostic indicator, cardiorespiratory biofeedback has the potential to improve cardiac mortality and morbidity in HF patients.
http://www.springerlink.com/content/533127v3471861t1/

Nakao M, Yano E, Nomura S, Kuboki T. **Blood pressure-lowering effects of biofeedback treatment in hypertension: a meta-analysis of randomized controlled trials.** Hypertens Res. 2003; 26: 37–46.
To examine the blood pressure-lowering effects of biofeedback treatment in patients with essential hypertension, a meta-analysis was conducted on studies published between 1966 and 2001. A total of 22 randomized controlled studies with 905 essential hypertensive patients were selected for review. Compared with clinical visits or self-monitoring of blood pressure (non-intervention controls), biofeedback intervention resulted in systolic and diastolic blood pressure reductions that were greater by 7.3 mmHg (for systole; 95% confidence interval: 2.6 to 12.0) and 5.8 mmHg (for diastole; 95% confidence interval: 2.9 to 8.6). Compared with sham or non-specific behavioral intervention controls, the net reductions in systolic and diastolic blood pressures by biofeedback intervention were 3.9 (95% confidence interval: -0.3 to 8.2) and 3.5 (-0.1 to 7.0) mmHg, respectively. The results of multiple regression analysis also indicated that biofeedback intervention decreased systolic and diastolic blood pressures more than non-intervention controls ($p <0.001$), but not more than sham or non-specific behavioral intervention controls ($p >0.05$), when controlling for the effects of initial blood pressures. When biofeedback intervention types were classified into two types, simple biofeedback and relaxation-assisted biofeedback, only the relaxation-assisted biofeedback significantly decreased both systolic and diastolic blood pressures ($p <0.05$) compared with those in sham or non-specific behavioral intervention controls. The results suggested that biofeedback was more effective in reducing blood pressure in patients with essential hypertension than no intervention. However, the treatment was only found to be superior to sham or non-specific behavioral intervention when combined with other relaxation techniques. Further studies will be needed to determine whether biofeedback itself has an antihypertensive effect beyond the general relaxation response. (Hypertens Res 2003; 26: 37-46)
http://www.jstage.jst.go.jp/article/hypres/26/1/26_37/_article/-char/en

Counselling, Health and Life Coaching

Hardcastle S et al. **A randomised controlled trial on the effectiveness of a primary health care based counselling intervention on physical activity, diet and CHD risk factors.** Patient Education and Counseling, Volume 70, Issue 1, Pages 31-39 (January 2008)
Abstract - Objective The aim of the study was to determine if multiple patient-centred lifestyle counselling sessions would be of interest to patients at risk of coronary heart disease (CHD), in a primary care setting, and if such sessions would result in changes in physical activity and diet, and health status. A randomised trial was conducted to compare the counselling intervention with usual care (health promotion leaflet), among 334 mostly obese patients.
Methods Patients were randomised into an intervention group that received standard exercise and nutrition information plus up to five face-to-face counselling sessions with a Physical Activity Specialist (PAS) and Registered Dietitian (RD) over a 6-month period or to a control group that only received the standard information.
Results Of those invited, patients randomised tended to be more obese, older and female. The mean (S.D.) sessions attended was 2.0 (1.6) with 50% attending at least 3. At 6 months, the counselling group were more active, particularly with respect to walking, and had reduced weight, blood pressure and cholesterol, but had not changed their diet, compared with the control group. Furthermore, those who did more sessions had greater increases in activity and reductions in weight, blood pressure and cholesterol.
Conclusion Attending multiple sessions of client-centred counselling in primary care was of interest to patients, and generally reduced CHD risk factors.
http://www.pec-journal.com/article/PIIS073839910700376X/fulltext

Resnicow K, Vaughan R**. A chaotic view of behavior change: a quantum leap for health promotion. I**nt J Behav Nutr Phys Act. 2006;12:3–25.
Background The study of health behavior change, including nutrition and physical activity behaviors, has been rooted in a cognitive-rational paradigm. Change is conceptualized as a linear, deterministic process where individuals weigh pros and cons, and at the point at which the benefits outweigh the cost change occurs. Consistent with this paradigm, the associated statistical models have almost exclusively assumed a linear relationship between psychosocial predictors and behavior. Such a perspective however, fails to account for non-linear, quantum influences on human thought and action. Consider why after years of false starts and failed attempts, a person succeeds at increasing their physical activity, eating healthier or losing weight. Or, why after years of success a person relapses. This paper discusses a competing view of health behavior change that was presented at the 2006 annual ISBNPA meeting in Boston.
Discussion Rather than viewing behavior change from a linear perspective it can be viewed as a quantum event that can be understood through the lens of Chaos Theory and Complex Dynamic Systems. Key principles of Chaos Theory and Complex Dynamic

Systems relevant to understanding health behavior change include: 1) Chaotic systems can be mathematically modeled but are nearly impossible to predict; 2) Chaotic systems are sensitive to initial conditions; 3) Complex Systems involve multiple component parts that interact in a nonlinear fashion; and 4) The results of Complex Systems are often greater than the sum of their parts. Accordingly, small changes in knowledge, attitude, efficacy, etc may dramatically alter motivation and behavioral outcomes. And the interaction of such variables can yield almost infinite potential patterns of motivation and behavior change. In the linear paradigm unaccounted for variance is generally relegated to the catch all "error" term, when in fact such "error" may represent the chaotic component of the process. The linear and chaotic paradigms are however, not mutually exclusive, as behavior change may include both chaotic and cognitive processes. Studies of addiction suggest that many decisions to change are quantum rather than planned events; motivation arrives as opposed to being planned. Moreover, changes made through quantum processes appear more enduring than those that involve more rational, planned processes. How such processes may apply to nutrition and physical activity behavior and related interventions merits examination.
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1586207/

Britt E, Hudson SM, Blampied NM. **Motivational interviewing in health settings: a review.** Patient Educ Couns. 2004;53:147–155.
Abstract
There is evidence that patient-centred approaches to health care consultations may have better outcomes than traditional advice giving, especially when lifestyle change is involved. Motivational interviewing (MI) is a patient-centred approach that is gathering increased interest in health settings. It provides a way of working with patients who may not seem ready to make the behaviour changes that are considered necessary by the health practitioner. The current paper provides an overview of MI, with particular reference to its application to health problems.
http://www.pec-journal.com/article/S0738-3991%2803%2900141-1/abstract?refuid=S0738-3991%2807%2900376-X&refissn=0738-3991

Lane C, Huws-Thomas M, Hood K, Rollnick S, Edwards K, Robling M. **Measuring adaptations of motivational interviewing: the development and validation of the behaviour change counselling index (BECCI).** Patient Educ Couns. 2005;56:116–173.
Short Abstract: Persuading patients to change behaviour that is damaging their health can be difficult. Changing the style of consultation could improve the experience for doctors and patients.
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1261200/