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Cochrane Database of Systematic Reviews 2010, Issue 2. Art. No.: CD008009.
DOI: 10.1002/14651858.CD008009.pub2.

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[Intervention Review]

Flexible working conditions and their effects on employee health and wellbeing

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Editorial group: Cochrane Public Health Group.
Publication status and date: New, published in Issue 2, 2010.

Citation: Joyce K, Pabayo R, Critchley JA, Bambra C. Flexible working conditions and their effects on employee health and wellbeing. *Cochrane Database of Systematic Reviews* 2010, Issue 2. Art. No.: CD008009. DOI: 10.1002/14651858.CD008009.pub2.

ABSTRACT

Background

Flexible working conditions are increasingly popular in developed countries but the effects on employee health and wellbeing are largely unknown.

Objectives

To evaluate the effects (benefits and harms) of flexible working interventions on the physical, mental and general health and wellbeing of employees and their families.

Search methods

Our searches (July 2009) covered 12 databases including the Cochrane Public Health Group Specialised Register, CENTRAL; MEDLINE; EMBASE; CINAHL; PsycINFO; Social Science Citation Index; ASSIA; IBSS; Sociological Abstracts; and ABI/Inform. We also searched relevant websites, handsearched key journals, searched bibliographies and contacted study authors and key experts.

Selection criteria

Randomised controlled trials (RCT), interrupted time series and controlled before and after studies (CBA), which examined the effects of flexible working interventions on employee health and wellbeing. We excluded studies assessing outcomes for less than six months and extracted outcomes relating to physical, mental and general health/ill health measured using a validated instrument. We also extracted secondary outcomes (including sickness absence, health service usage, behavioural changes, accidents, work-life balance, quality of life, health and wellbeing of children, family members and co-workers) if reported alongside at least one primary outcome.

Data collection and analysis

Two experienced review authors conducted data extraction and quality appraisal. We undertook a narrative synthesis as there was substantial heterogeneity between studies.

Main results

Ten studies fulfilled the inclusion criteria. Six CBA studies reported on interventions relating to temporal flexibility: self-scheduling of shift work (n = 4), flexitime (n = 1) and overtime (n = 1). The remaining four CBA studies evaluated a form of contractual flexibility: partial/gradual retirement (n = 2), involuntary part-time work (n = 1) and fixed-term contract (n = 1). The studies retrieved had a number of methodological limitations including short follow-up periods, risk of selection bias and reliance on largely self-reported outcome data.

Four CBA studies on self-scheduling of shifts and one CBA study on gradual/partial retirement reported statistically significant improvements in either primary outcomes (including systolic blood pressure and heart rate; tiredness; mental health, sleep duration, sleep quality and alertness; self-rated health status) or secondary health outcomes (co-workers social support and sense of community) and no ill health effects were reported. Flexitime was shown not to have significant effects on self-reported physiological and psychological health outcomes. Similarly, when comparing individuals working overtime with those who did not the odds of ill health effects were not significantly higher in the intervention group at follow up. The effects of contractual flexibility on self-reported health (with the exception of gradual/partial retirement, which when controlled by employees improved health outcomes) were either equivocal or negative. No studies differentiated results by socio-economic status, although one study did compare findings by gender but found no differential effect on self-reported health outcomes.

Authors' conclusions

The findings of this review tentatively suggest that flexible working interventions that increase worker control and choice (such as self-scheduling or gradual/partial retirement) are likely to have a positive effect on health outcomes. In contrast, interventions that were motivated or dictated by organisational interests, such as fixed-term contract and involuntary part-time employment, found equivocal or negative health effects. Given the partial and methodologically limited evidence base these findings should be interpreted with caution. Moreover, there is a clear need for well-designed intervention studies to delineate the impact of flexible working conditions on health, wellbeing and health inequalities.

PLAIN LANGUAGE SUMMARY

Flexible working conditions and their effects on employee health and wellbeing

Flexible working arrangements, such as flexitime and teleworking, are becoming more common in industrialised countries but the impacts of such flexibility on employee health and wellbeing are largely unknown. This review examined the health and wellbeing effects of flexible working arrangements which favour the worker as well as those dictated by the employer (for example, fixed-term contracts or mandatory overtime).

Ten controlled before and after studies were found which evaluated the effects of six different types of flexible working arrangement on employee health and wellbeing: self-scheduling (n = 4); flextime (n = 1); overtime (n = 1); gradual retirement (n = 2); involuntary part-time (n = 1) and fixed-term contract (n = 1).

Self-scheduling of shift interventions and employee controlled partial/early retirement were found to improve health (including systolic blood pressure and heart rate; tiredness; mental health, sleep duration, sleep quality and alertness; and self-rated health status) and/or wellbeing (co-workers' social support and sense of community) and no ill health effects were observed.

The studies of overtime working, flexitime and fixed-term contracts found no significant effects on physical, mental or general health or on any of the wellbeing outcomes examined. Importantly, however, the study on overtime failed to provide detailed information on either the amount or duration of overtime worked, so it is therefore difficult to draw any conclusions regarding the effects of overtime on workers' health and wellbeing.

Overall, these findings seem to indicate that flexibility in working patterns which gives the worker more choice or control is likely to have positive effects on health and wellbeing. However, given the small number of studies included in the review and their methodological limitations, caution should be applied to this conclusion. Well-designed studies are therefore needed to further explain the relationship between flexible working and health and wellbeing.

Summary of findings for the main comparison. Summary of findings: primary health outcomes - temporal flexibility

Study	Intervention	Population and setting	Follow-up period & final sample size	Primary outcomes	Summary findings
De Raeve 2007	Overtime	Various settings (45 companies), the Netherlands Blue and white collar workers, mostly male (82.5% male in population from which sample was taken)	12 and 24-month follow up Final sample n = 1871; 252 intervention, 1619 control	Mental health: psychological stress, GHQ-12 (Goldberg 1991) General health: self-rated general health (one item from the SF-36 Aaronson 1998); prolonged fatigue (20 items, Checklist Individual Strength Vercoulen 1994) and need for recovery from work (11 items, VBBA, van Veldhoven 2003)	There were no statistically significant associations between overtime and need for recovery or psychological distress in either men or women. Reference = no overtime at T1 or T2 Transition from no overtime at T1 to overtime at T2 Adjusted OR 95% CI Men Need for recovery 1.31 (0.87 to 1.98) Psychological distress 1.16 (0.83 to 1.64) Women Need for recovery 1.47 (0.64 to 3.38) Psychological distress 0.81 (0.40 to 1.62) Transition from overtime at T1 and no overtime at T2 Men Need for recovery 1.63 (1.23 to 2.15) Psychological distress 0.82 (0.64 to 1.05) Women Need for recovery 1.96 (1.04 to 3.69) Psychological distress 1.00 (0.63 to 1.59) Overtime at both T1 and T2 Men Need for recovery 0.58 (0.36 to 0.93) Psychological distress 0.69 (0.49 to 0.98) Women Need for recovery 0.44 (0.15 to 1.27) Psychological distress 0.69 (0.37 to 1.29)
Dunham 1987	Flextime, with a core working period between 1.30	Corporate office of a Midwestern utility organisation,	3 and 6 months follow up	Physiological and psychological	No significant change in psychological stress or psychological stress Dunn Bonferroni statistics

	and 3.30, but with flexibility regarding start and finish times and timing and duration of lunch breaks. Workers were required to plan their schedules one week in advance and supervisors could request changes to facilitate department functioning.	USA. Non-supervisory (professional, clerical, and technical) and supervisory personnel. Data on male:female ratio not reported.	Final sample size n = 102; 55 intervention, 47 control	stress, 7-item scale (Patchen 1970)	Physiological stress: Pretest and first post-test: -0.487 Pretest and second post-test: -0.708 Second and first post-test: -0.262 Psychological stress: Pretest and first post-test: -0.757 Pretest and second post-test: -0.778 Second and first post-test: -0.099
Kandolin 1996	Self-scheduling of hours (part of a multiple intervention with changes to shift rotation including slow to fast rotation and backward to forward rotation)	Hospital, Finland Midwives, all female	6-month follow up Final sample n = 58; 45 intervention, 13 control	Mental stress, tiredness, mental strain (Standard Shiftwork Index, Barton 1992 and Occupational Stress Questionnaire, Elo 1992)	A significant decrease in tiredness (defined as rather or very tired) during night shift (from 53% to 44%) was noted, time x group interaction P = 0.02 Non-significant differences in mental stress (somewhat or much mental stress) and mental strain (rather or very strenuous) Mental strain (morning shift) Intervention, Before 27% Intervention, After 11% Time*group P = 0.09 Mental strain (evening shift) Intervention, Before 17% Intervention, After 9% Time*group P = 0.29 Mental stress Intervention, Before 27% Intervention, After 15% Time*group P = 0.07
Pryce 2006	Open-rota scheduling system. Within this system employees were asked to schedule their shift preferences into an open (uncompleted) rota. The rota was then fine-tuned by one or two staff members and this responsibility was ro-	Psychiatric hospital, Denmark 60% nurses, 40% healthcare workers, predominantly female (92%)	20-month follow up Final sample n = 166; 80 intervention, 86 control	Mental health: Stress symptoms, three 4-item scales: behavioural cognitive and somatic symptoms (Setterlind 1995) Vitality, 4 items (Setterlind 1995) General health:	No significant benefits to any of the health outcomes were reported but non-significant trends were noted for somatic symptoms and vitality Mean (SD), F-ratio (df) Self-rated health Int Pre 58.48 (16.56) Int Post 60.07 (23.04) Con Pre 60.33 (20.12) Con Post 58.82 (29.01) F (176) = 0.34 Behavioural symptoms Int Pre 21.93 (18.01) Int Post 20.01 (16.43) Con Pre 20.01 (15.64) Con Post 23.34 (15.66) F (174) = 0.95

	tated each week between the staff.			Global self-rated health (Borg 2000)	Cognitive symptoms Int Pre 27.04 (15.03) Int Post 29.54 (20.03) Con Pre 26.48 (16.63) Con Post 30.06 (16.88) F (174) = 0.99 Somatic symptoms Int Pre 33.53 (13.33) Int Post 34.33 (13.65) Con Pre 34.75 (10.81) Con Post 38.45 (10.75) F (175) = 1.25 Vitality Int Pre 54.47 (15.90) Int Post 56.67 Con Pre 63.50 (16.23) Con Post 57.36 (17.36) F (174) = 1.72
Smith 1998	CWW, 5 or 7 8-hour shifts with 2 or 3 days off to either (a) flexible starts with 4 12-hour shifts, then 4 days off or (b) rigid starts with 4 12-hour shifts, then 4 days off	Police service, UK Police officers, mostly male	6-month follow up, final sample n = 45, 27 intervention 18 control (numbers of participants on flexible and fixed starts unclear, presumably approx 50% in each)	Physical health questionnaire (Barton 1995); sleep alertness, chronic fatigue (Standard Shiftwork Index); psychological stress (GHQ-12, Goldberg 1972)	No significant changes for physical health measures (including digestive problems, cardiovascular problems and pain - data not reported). A significant interaction effect on psychological wellbeing was found (F = 5.11, P < 0.05) with mental health improving on the flexible system but worsening on the rigid rota. Interaction effects were also observed for day shift sleep quality (F = 4.59, P < 0.05), night shift alertness (F = 4.21, P < 0.05), night shift sleep durations (F = 6.49, P < 0.05). No significant interaction effect was observed for day shift alertness (F = 1.75, P > 0.05) or night shift sleep quality (data not given)
Viitasalo 2008	Flexibility of a shift system The intervention involved some individual control and choice regarding shift preferences which was balanced against employer needs. Rosters were issued 4 weeks in advance, after which the employer could only make changes in the rotas of the 3rd or 4th week in case of changed operational needs.	Airline company (line maintenance), Finland Maintenance workers, all male	7 to 8 months follow up Final sample n = 84; 22 intervention, 22 control (no change backward rotating) 40 control (change to rapidly forward rotating)	Physical health experimental measures: blood pressure, heart rate, total cholesterol, HDL, LDL, triglycerides, fasting plasma glucose, glycosylated haemoglobin, C- reactive protein General health: Sleepiness and sleep disturbances; falling asleep at work (Epworth Sleepiness Scale, ESS, Johns 1991)	Mean systolic BP decreased from 142 to 136 mm Hg (P = 0.049) and heart rate decreased from 66 to 60 beats/minute (P = 0.06) in the experimental group when compared to the other groups (rapid forward rotation BP increased by 2.5 mmHg, control group no change in BP) Changes in diastolic BP were not significant (exact figures not given, graphs only) Changes in the ESS scale (probability of falling asleep at work) decreased but the change was not statistically significant (intervention group score decreased from 7.5 (SD 5.3) to 7.1 (SD 4.4) and control group (no change) increased from 7.8 (SD 3.8) to 8.3 (SD 3.9). For the group changing to forward rotating the ESS score showed a slight decrease from 6.4 (SD 2.7) to 6.2 (SD 3.5). Daytime sleepiness showed a declining trend in all 3 groups (P = 0.06). No statistically significant differences in the interaction between time and group were observed for the following biomarkers:

					Total cholesterol (mmol/l) Mean (SD) Int Pre 5.0 (0.7) Int Post 5.0 (0.8) Con Pre 5.2 (1.1) Con Post 5.3 (1.2) HDL cholesterol (mmol/l) Mean (SD) Int Pre 1.3 (0.3) Int Post 1.4 (0.3) Con Pre1.5 (0.3) Con Post 1.6 (0.3) LDL cholesterol (mmol/l) Mean (SD) Int Pre 3.2 (0.7) Int Post 3.1 (0.8) Con Pre 3.0 (0.9) Con Post 3.1 (1.0) Triglycerides (mmol/l) Mean (SD) Int Pre 1.3 (0.6) Int Post 1.3 (0.7) Con Pre 1.2 (0.9) Con Post 1.3 (0.7) Fasting plasma glucose (mmol/l) Mean (SD) Int Pre 5.2 (0.4) Int Post 5.0 (0.4) Con Pre 5.2 (0.4) Con Post 5.0 (0.5) Glycosylated haemoglobin (%) Mean (SD) Int Pre 5.1 (0.3) Int Post 4.9 (0.4) Con Pre 5.1 (0.2) Con Post 5.0 (0.4) High sensitivity C reactive protein (mg/l) Mean (SD) Int Pre 0.8 (0.8) Int Post 1.1 (1.2) Con Pre 0.9 (0.6) Con Post 1.2 (1.0)

BP = blood pressure; Con = control; CWW = compressed working week; ESS = Epworth Sleepiness Scale; GHQ = General Health Questionnaire; HDL = high-density lipoprotein; Int = intervention; LDL = low-density lipoprotein; SD = standard deviation

Summary of findings 2. Summary of findings: primary outcomes - contractual flexibility

Study	Intervention	Population and setting	Follow-up period & final sample size	Primary outcomes	Summary findings
Calvo 2009	Gradual/partial retirement	Health and Retirement Study, USA (a nationally representative biennial survey of older Americans and their spouses), 49.4% male	24 months (1992 to 1994) Final sample n = 1389; 656 intervention 733 control	Depression (Diener 1999; Frey 2002; Perreira 2005; Veenhoven 1991)	No significant changes in depression for either the partial or abrupt retirement groups between T1 and T2 Mean (Standard Deviation) Phased retirement T1 0.120 (0.326) T2 0.165 (0.371) Change in depression 0.044 (0.413) Control (abrupt retirement)

					T1 0.118 (0.322) T2 0.149 (0.357) Change in depression 0.032 (0.413)
de Vaus 2007	Gradual/partial retirement	Australian Healthy Retirement Project % male (pathway and level of control): Abrupt/high 46.3% Abrupt/low 48.5% Gradual/high 63.9% Gradual/low 59.2%	1998 to 2001 12, 24, 36 months Final sample n = 358; 138 intervention (gradual retirement), 220 control (abrupt retirement)	General health: health Mental health: positive affect (Lawton 1992), negative affect (Lawton 1992), self-image (Adelmann 1994; Rosenberg 1965; Scheier 1985)	Beta coefficients and P values CHANGE IN HEALTH Pathway, T12 0.14 P < 0.01 Pathway, T36 0.04 Control/choice, T12 0.05 Control/choice, T36 0.06 Interaction Path & Con, T12 -0.12 Interaction Path & Con, T36 0.09 CHANGE IN POSITIVE AFFECT Pathway, T12 -0.04 Pathway, T36 0.03 Control/choice, T12 0.12 P < 0.01 Control/choice, T36 0.09 P < 0.05 Interaction Path & Con, T12 -0.06 Interaction Path & Con, T36 -0.38 P < 0.05 CHANGE IN NEGATIVE AFFECT Pathway, T12 -0.02 Pathway, T36 -0.02 Control/choice, T12 0.15 P < 0.01 Control/choice, T36 0.10 P < 0.01 Interaction Path & Con, T12 -0.38 P < 0.05 Interaction Path & Con, T36 0.05 CHANGE IN SELF-IMAGE

					Pathway, T12 -0.02 Pathway, T36 -0.03 CONTROL OF PATHWAY Control/choice, T12 0.19 P < 0.001 Control/choice, T36 0.16 P < 0.001 Interaction Path & Con, T12 0.02 Interaction Path & Con, T36 -0.28
Dooley 2000	Inadequate employment (or underemployment) included involuntary part-time contracts and those on a poverty wage	National Longitudinal Survey of Youth (NLSY), USA, 56.9% male	24-month follow up 1992 and 1994, final sample n = 5113 (subjects adequately employed in 1992 with complete data) Retention rate 89.2% in 1994 227 intervention (inadequately employed) 4437 control	Psychological functioning, measured using the Center for Epidemiologic Studies Depression scale (CES-D)	Becoming inadequately employed was associated with increased depression when compared with remaining adequately employed and after adjusting for depression at baseline and "contextual factors" (b = 0.67, Beta = 0.04, t = 2.80, P < 0.05). This association remained significant after controlling for family poverty status and marital status (b = 0.71, Beta = 0.04, t = 2.98, P < 0.05)
Rodriguez 2002	Fixed-term contract	Three years of data (1991 to 1993), Britain and Germany, Household Panel Comparability Project Britain 46% male Germany 47% male	12-month follow up (1992 to 1993) for change in employment status data Change from full or part-time employed with permanent contract in 1992 to full/part-time with no permanent contract in 1993 Comparison = permanent contract in both years Britain: 103 intervention, 3613 control	Perceived health status (Benyamin 1999; Idler 1997)	In both Britain and Germany no statistically significant differences were noted in perceived health status (likelihood of reporting of fair, poor or very poor health) in those moving from permanent contract at baseline to fixed-term or no contract at follow up when compared with those with permanent contracts at both time points Odds ratio (CI), reference permanent contract at both time points UK No permanent contract at follow up 0.73 (0.42 to 1.28) Germany No permanent contract at follow up 0.81 (0.44 to 1.53)

		Germany: 75 intervention, 4075 control			

Summary of findings 3. Summary of findings: secondary outcomes - all flexibility types

Study	Intervention	Population & setting	Follow up & final sample size	Secondary outcomes	Summary findings
Pryce 2006	Open-rota scheduling system	Psychiatric hospital, Denmark 60% nurses, 40% healthcare workers, predominantly female (92%)	20-month follow up Final sample n = 166; 80 intervention, 86 control	Quality of life: Sense of community, 3-item scale from the Copenhagen Psychosocial Questionnaire (Kristensen 1998) Social support from the Copenhagen Psychosocial Questionnaire (Kristensen 1998)	Measures of wellbeing of co-workers: Significant increases were noted in social support and sense of community Social support Int Pre 69.98 (14.30) Int Post 73.85 (21.38) Con Pre 70.53 (16.60) Con Post 70.33 (15.13) F (174) = 4.05, P = 0.001 Sense of community Int Pre 76.48 (14.11) Int Post 84.86 (14.06) Con Pre 75.40 (14.81) Con Post 70.79 (15.15) F (176) = 4.44, P = 0.001
Smith 1998	CWW, 5 or 7 8-hour shifts with 2 or 3 days off to (a) flexible starts with 4 12-hour shifts, then 4 days off or (b) rigid starts with 4 12-hour shifts, then 4 days off	Police service, UK Police officers, mostly male	6-month follow up, final sample n = 45 27 intervention (a or b) 18 control, (no change) Numbers of participants on flexible and fixed starts unclear presumably approx 50% in each)	Interference with social and family life (Barton 1995, Standard Shiftwork Index)	No significant changes for interference with social and family life (data not reported)
Viitasalo 2008	Flexibility of a shift system "Rosters were issued 4 weeks in advance, after which the employer could only make changes in the rotas of the third or fourth week in case of changed operational needs. On the basis of mutual con-	Airline company (line maintenance), Finland Maintenance workers, all male	7 to 8 months follow up Final sample n = 84; 22 intervention, 22 control (no change backward rotating, 40 change to rapidly forward rotating	Physical activity (International Physical Activity Questionnaire (Craig 2003)) Alcohol, caffeine, quality of fat and fibre intake	No significant differences in the interaction between time and group for PA, or dietary habits as assessed by the quality of fat or the intake of fibre, caffeine or alcohol Physical activity (h/week) Median (range) Int Pre 2.6 (0 to 12) Int Post 2.5 (0 to 12) Con Pre 3.8 (0 to 8) Con Post 3.5 (0 to 21)

	sent, the employer tried to fulfil the employee's wishes and needs regarding shift changes, holidays, or days off. The workers were therefore allowed some individual flexibility and control over their work hours in exchange for variability. In the flexible shift system, the direction of rotation and the order of the shifts were basically the same as in the old shift system, but there are generally three consecutive days "off" between the evening, morning, and night shifts instead of two as in the old system.				Proportion of unsaturated to saturated fats Mean (SD) Int Pre 17(4) Int Post 18 (4) Con Pre 15 (6) Con Post 15 (7) Dietary fibre (g/day) Mean (SD) Int Pre 21 (10) Int Post 22 (7) Con Pre 22 (10) Con Post 22 (10) Caffeine (mg/day) Median (range) Int Pre 450 (0 to 1220) Int Post 500 (0 to 1600) Con Pre 380 (90 to 1160) Con Post 350 (30 to 1100) Alcohol (g/day) Median (range) Int Pre 5 (1 to 40) Int Post 7 (0 to 49) Con Pre 5 (0 to 20) Con Post 4 (0 to 22)
de Vaus 2007	Partial retirement	Australia Healthy Retirement Project, male:female ratio unclear	1998 to 2001 12, 24, 36 months Final sample n = 35;138 intervention (gradual retirement), 220 control (abrupt retirement)	Quality of life: life satisfaction (Campbell 1976), marital cohesion (Spanier 1976)	Beta coefficients and significance CHANGE IN LIFE STATISFACTION Pathway, T12 -0.02 Pathway, T36 -0.09 Control/choice, T12 0.15 P < 0.01 Control/choice, T36 0.06 Interaction Path & Con, T12 -0.39 Interaction Path & Con, T36 -0.25 CHANGE IN MARITAL COHESION Pathway, T12 -0.03 Pathway, T36 0.04 Control/choice, T12 0.04 Control/choice, T36 0.12 P < 0.05 Interaction Path & Con, T12 -0.36 Interaction Path & Con, T36 -0.53 P < 0.05

CWW = compressed working week; PA = physical activity

BACKGROUND

It is well established that work and the workplace are important social determinants of health (Acheson 1998; CSDH 2008; Townsend 1992). Not only is work vital in terms of personal income, adequate quality work also fulfils human needs by shaping personal identity, securing social status and giving structure and purpose to daily life (Black 2008; Waddell 2006). According to Karasek's demand-control model (Karasek 1979; Karasek 1990) jobs characterised by excessive psychological demands coupled with low decision latitude (low decision authority and low skill utilisation) are stressful as they do not enable individual autonomy, are conducted in high-pressure contexts and can thus lead to an increased risk of stress-related morbidity. A considerable body of evidence from the Whitehall studies supports the influence of the psychosocial work environment on health (see Bosma 1997; Kuper 2003; Marmot 1991). For example, high psychological job demands combined with low control or decision latitude (a combination known as high job strain) in the workplace have been associated with adverse outcomes relating to risk of coronary heart disease (Bosma 1997), mental health (Stansfeld 1999) and sickness absence (North 1996). Conversely, social support from co-workers and supervisors in the workplace has been shown, in some studies, to reduce ill health effects (Stansfeld 1997). The term high 'iso-strain' is used to refer to working conditions defined by high demands, low control and low social support.

Occupations in both the industrial and service sectors tend to be associated with high strain and iso-strain (Marmot 2006). The distribution of low control and low support has been shown to follow the social gradient (with high strain and iso-strain being found in low status workers) although the same its not true for high job demands which tend to be disproportionately spread amongst higher occupational grade or managerial status workers (Bosma 1997; Siegrist 2009). Importantly, the risk of stress-related diseases is heightened with prolonged exposure over the life course (Marmot 2006).

Critics of the Karasek model have prioritised certain aspects of the model, for example by arguing that control may be more important than psychological demands (Godin 2003; Siegrist 2004) and others have drawn attention to mediating factors such as mastery, self-efficacy or social support in the pathway between psychosocial work factors and physical or psychological morbidity (Marmot 2006). In addition, researchers have cautioned against the reliance on workplace psychosocial models in isolation to explain health outcomes and have emphasised the importance of non-work related, individual level factors such as income, status in the community and health behaviours (Bartley 2004). The effort-reward imbalance model represents an alternative but nonetheless complementary hypothesis which takes account of the concept of social reciprocity (Marmot 2006). The premise of the effort-reward imbalance model is that psychosocial stress results from a mismatch between the efforts made by workers and the rewards they receive from their employer in terms of pay, esteem, job security and career opportunities (Siegrist 1996). Working with low rewards is thought to induce stress responses which lead to adverse health outcomes (Siegrist 2009).

In acknowledgement of these relationships, policymakers are increasingly targeting interventions to improve health and reduce health inequalities in the workplace (Black 2008; CSDH 2008). Interventions can be targeted at either the individual level (e.g. improving individual coping strategies), the micro-organisational level (e.g. re-structuring work tasks) or the macro-organisational level (e.g. changing the dynamics of decision-making) level (Bambra 2007). Karasek 1992 suggests that work tasks can be restructured in three key ways: (i) job enrichment and enlargement (task variety); (ii) collective coping and decision-making (teamworking); or (iii) the use of autonomous production groups, all of which are likely to increase levels of control and possibly supervisor and co-worker support. Based on the demand-control-support model, it is suggested that interventions of this nature which increase levels of worker control are likely to have positive effects on health outcomes, particularly psychological health. Indeed, two systematic reviews which considered the effects of both macro- (Egan 2007) and micro-organisational (Bambra 2007) (task restructuring) level changes to the work environment found that interventions which increased worker control and autonomy were associated with some positive changes in health outcomes, most notably reductions in anxiety and depression (Egan 2007). In terms of differential effects by socio-economic status, little evidence was found (Bambra 2007).

Description of the intervention

In this review flexible working conditions are characterised by three working principles: contractual flexibility (employer or employee fluidity regarding employment contracts), spatial flexibility (employer or worker control and choice regarding place of work) and temporal flexibility (employer and worker choice regarding the distribution of worked hours) (Hill 2008). By way of illustration, examples include (but are not limited to): teleworking and home working (working off site and communicating with the office by telecommunication links); job sharing (two or more people sharing the responsibilities of a full-time job by working part-time on an ongoing basis); flexitime (a variable work schedule which deviates from traditional 'office' hours) and other non-standard working schedules, such as annualised hours (hours averaged over a year).

Flexible working conditions are becoming increasingly common within modern economies, and in many countries legislation has been introduced enabling certain groups of employees to request flexible working. For example, Scandinavian countries in particular grant extensive flexible working rights, such as parental leave, flexitime and other family friendly provisions to employees (Brandth 2001; Pärnänen 2007). Similarly, since 2003 the right to request flexible working conditions has been granted to all UK employees with children aged under six years or to those with caring responsibilities (BERR 2008). This right has recently been extended to employees with children aged up to 16 years (BERR 2009). Many of these legislative changes have been explicitly or implicitly underpinned by the assumption that flexible working will have positive effects on employee adaptability, performance (Artazcoz 2005), work-life balance and health (MacEachen 2008). In a number of low and middle-income countries flexible working hours is a relatively new concept which tends to be restricted to large multi-national companies (see for example Eurofound 2009). Conversely, employment in informal labour is much more commonplace in developing countries, where employer-orientated forms of flexibility, such as causal labour, tend to be the norm rather than the exception (Benach 2007).

Against this backdrop, the World Health Organization (WHO) Commission on the Social Determinants of Health recognises the need for policy development to address issues relating to work-life balance including, amongst others, the right to flexible working arrangements (CSDH 2008). The consequences of flexible working policies also have equity implications, which need to be better understood (Artazcoz 2005).

How the intervention might work

It is important to acknowledge that flexible working arrangements may have positive or negative impacts depending partly on whether the flexibility is employee-negotiated or employer-orientated (Pärnänen 2007). For example, where employers dictate conditions in terms of contracts, work hours, salary forms or work places, uncertainty leading to possible job insecurity and reduced autonomy may be introduced into employees' everyday lives (Artazcoz 2005; Benach 2002; MacEachen 2008; Pärnänen 2007). Employers may introduce flexible working arrangements for a number of different reasons, such as to improve productivity and performance (Artazcoz 2005). Conversely, workers' requests for flexible working conditions may be driven by the need to better manage work and domestic or childcare responsibilities (Webster 1996). In this instance the intended positive effects could be improved work-life balance or increased choice and control over work hours. It is therefore important to capture the reason for adopting such practices to assess whether the arrangements are dictated by the employer or requested by the employee.

Several commentators have highlighted the beneficial effects of employee-negotiated flexible working on health and wellbeing, such as reduced stress and stress-related illnesses, reduced sickness absence and improved work-life balance (including time spent with children and marital satisfaction) (Albertson 2008; MacEachen 2008). Organisational arrangements, such as home working and staggered working hours, are promoted by employers as a way of negotiating the conflicting demands of work and domestic responsibilities. However, as Webster 1996 observes, such policies place the onus for childcare provision on the individual, usually women, and absolve the state of responsibility. Further, the promotion of home working can result in reduced social interaction and 'intensification' of work (Webster 1996) as the traditional boundaries between work and domestic life become blurred. Researchers have also questioned how flexible working arrangements continue to be treated as a concession rather than a right (Truman 1992), including in legislation (for example in the UK there is a right to request flexible working but not to receive it).

In terms of gender equity, a number of authors maintain that there is potential for flexible working policies to result in women becoming a source of disposable flexible labour and any gains offered by flexibility are likely to be polarised towards men rather than women (Truman 1992; Webster 1996). As Truman 1992 argues the benefits of employer-orientated flexibility are likely to be limited and the deregulation of working conditions could instead have adverse consequences in terms of reduced job security, lower compensation and poorer working conditions. In summary, the literature suggests that employee-negotiated flexible working interventions are expected to have more positive effects on health and wellbeing than employer-orientated interventions.

Why it is important to do this review

Although reviews of the effects of work patterning have been conducted, there is little synthesised evidence available on the effects of flexible working arrangements on employee health and wellbeing and on health inequalities (Artazcoz 2005; Benach 2002;). An earlier systematic review on the health and wellbeing effects of changing the organisation of shift work showed that three types of intervention (switching from slow to fast rotation; changing from backward to forward rotation; and self-scheduling of shifts) can improve the health of employees, their work-life balance, or both (Bambra 2008a). Similarly, a related systematic review has shown that 'Compressed Working Week' interventions (an alternative work schedule in which the hours worked per day are increased, whilst the days worked are decreased in order to work the standard number of weekly hours in less than five days (Ronen 1981)) can improve work-life balance, and that they may do so with a low risk of adverse health or organisational effects (Bambra 2008b).

In addition, the equity implications of flexible working conditions are largely unknown. For example, Artazcoz 2005 draws attention to lacunae in the evidence base relating to how flexible working practices impact on the health of different groups across the socio-economic strata and by occupational group, ethnicity or gender (Artazcoz 2005). Indeed, it can be seen in the health promotion literature more generally that population interventions tend to be taken up (and benefits are experienced) differentially by individuals in high socio-economic/occupational groups compared with those people with lower income, status or skills (Frohlich 2008). In this way flexible working arrangements have the potential to exacerbate existing patterns of inequity.

It is therefore important that the international evidence base relating to flexible working is synthesised and appraised to ascertain whether or not the health effects of flexibility vary by socio-economic status or demographic characteristics (that is by age, ethnicity or gender). The review is funded by the Department of Health Cochrane Review Incentive Scheme and is particularly topical at this time with the recognition that flexible working is "now endemic in modern economies" (MacEachen 2008) and countries are beginning to legislate on workplace flexibility. For example, as of 6 April 2009 the UK government extended the right to request flexible working conditions to all parents with children aged 16 or under (BERR 2009). Thus, there is potential for the findings of this review to directly impact on policy development both within the UK and internationally (Bambra 2008c). The findings will also be of interest to employee advocacy groups and employer representative organisations.

OBJECTIVES

The main review objective was to evaluate the effects (benefits and harms) of flexible working interventions on the physical and mental health and wellbeing of employees working in formal labour.

The secondary objectives were a) to compare whether there were any differential effects on physical and mental health and wellbeing in terms of job type, gender, age, ethnicity or socio-economic status; and b) to examine how flexible working arrangements impact on the social wellbeing and work-life balance of employees and their families.

METHODS

Criteria for considering studies for this review

Types of studies

Searches were conducted for the following study types:

- randomised controlled trials;
- interrupted time series;
- controlled before and after studies (prospective cohort studies).

We excluded uncontrolled studies and studies that reported outcomes for less than six months.

Types of participants

Study participants were defined as adults of working age working for profit or pay in formal labour. Studies were included if the mean age of participants was within the common working age range (16 to 64 years). The age range of 16 to 64 reflects the typical employment age in developed countries worldwide and has been used in a number of other Cochrane Reviews (see, for example, Turner-Stokes 2005).

Types of interventions

Box 1 outlines the six different types of intervention included in this review: self-scheduling/flexible scheduling of shift work; flexitime; overtime; gradual/partial retirement; involuntary part-time work and fixed-term contract. They are underpinned by the three principles of flexibility: contractual flexibility, spatial flexibility and temporal flexibility. Some interventions involved one of these principles exclusively, while others involved a combination of principles. For example, gradual or partial retirement relates to contractual flexibility whereas flexitime might be contractual but implicitly it offers choice and control regarding hours worked. The unifying aspect of these forms of flexibility is increased choice or control for either the employer or worker with respect to where, when or how work is undertaken. We have therefore excluded interventions which involve a transition from one fixed working arrangement to another different but nonetheless fixed working arrangement (e.g. changing from a fixed eight-hour shift schedule to a fixed 12-hour schedule (see Bambra 2008b for a review of compressed working week interventions)).

We also examined whether interventions were determined by the employer or negotiated by the worker. Where possible we extracted data on the underlying reason for adopting flexible working arrangements. For example, the decision to implement flexible working might have related to an employer's efforts to decrease costs, maximise workflow or to respond to production requirements. Conversely, the decision may have been motivated by the worker in terms of negotiating a better work-life balance, accommodating childcare demands or travelling at off peak times. In some instances it was difficult to assess whether flexibility was defined by the employer or employee. With this in mind we used a number of different measures to capture data on the orientation and favourability of flexible working arrangements. These included arrangements apparently actively chosen by the worker (Y/N), reasons for practices (open text) and worker or employer favourable (Y/N) (please refer to Appendix 2 for further details). In the instance that it was not possible to complete these criteria 'no motivation given' was reported on the data extraction form.

Box 1: Flexible working interventions included in the search strategy for this review

Temporal flexibility

Self-scheduling/flexible scheduling

Self-scheduling or flexible scheduling interventions involve changes in start and finish times to enable increased choice and control regarding working hours. This type of intervention allows the individual needs of the worker to be taken into account when organising shifts and in systems with higher levels of flexibility workers can participate in the design of the roster/rota (Barton 1993).

Flexitime

Flexitime or flextime involves a variable work schedule which deviates from traditional 'office' hours and allows workers to choose their own start and finish times to align with extraneous commitments (Kuang-Jung 2001). Flexitime schedules often involve a core period (e.g. 11.00 to 15.00) during which time all employees are expected to be in the workplace (Dunham 1987). Some organisations may request that workers plan schedules in advance.

Annualised hours

Annualised hours represent another form of non-standard working hours where the employee is contracted to work an aggregate number of hours annually and the actual weekly hours worked may vary (Arrowsmith 2007). Changes to hours worked (for example, to accommodate employee time off) can be negotiated by the employee but often are dictated by the employer to accommodate variations in demand or workflow. Annualised hours remain a rare form of flexible working in many economies which, as Arrowsmith 2007 speculates, may be due to the need for collective bargaining and high levels of trust in the employer/worker relationship.

Overtime

Overtime arrangements, where the employee works beyond their contracted hours, are likely to be dictated by organisational demand, productivity requirements and staffing dynamics (De Raeve 2007) but in some instances overtime may be requested by the worker, for example for financial gain.

Spatial flexibility

Teleworking

Teleworking is an arrangement which involves working off site and communicating with the office by telecommunication links. Home working is one form of teleworking. Workers might adopt teleworking arrangements for the entirety of their work schedule; alternatively they might work remotely for a proportion of their time on a weekly or monthly basis (Buddendick 1999).

Contract flexibility

Involuntary part-time

For involuntary part-time workers the choice to work part-time (less than 35 hours per week) is out of their control and is dictated by the organisation or employer for one or more of the following reasons: slack work, material shortages, equipment or plant repair, start of a new job/end of an old job, avoidance of the labour rights and social insurance costs associated with a full-time employee (Dooley 2000).

Partial/gradual retirement

Partial or gradual retirement is defined here as progressive withdrawal from work or withdrawal and subsequent return to part-time work (de Vaus 2007). In other words, individuals are working less than a standard working week but are not fully retired. Latulippe 2000 (p.179) define partial retirement as a transition period of part-time work between an employee's career job and retirement, which includes payment of either a partial or a full pension. Partial or gradual retirement is likely to be voluntary but in some cases may be dictated by the employer.

Fixed-term contract

Fixed-term contracts are a form of marginal or precarious employment dictated by the employer and characterise individuals working without a permanent contract for a fixed period of time (Rodriguez 2002). Fixed-term contracts tend to be disproportionately spread across the workforce, with lower socio-economic status workers having an elevated risk of exposure (Siegrist 2002).

Job share

Job sharing is a voluntary arrangement which involves two or more people sharing the responsibilities of a full-time job and the salary, leave and benefits between them by working part-time on an ongoing basis (Anderson 1989; Branine 2003). The individuals involved in the job share are charged with the responsibility of dividing the workload effectively and equitably and ensuring all duties are completed (Adamson 1994; Anderson 1989).

Types of outcome measures

Primary outcomes

The primary outcome measures included physical health/ill health, mental health/ill health and general health/ill health indicators measured using validated instruments (some possible examples are listed in Table 1).

Table 1: Examples of primary outcomes measured

Primary outcomes	Possible examples of measurements
Physical health/ill health	Physician diagnoses
e.g. musculoskeletal disorders, cardiovascular complaints (and proxies, such as hypertension), fatigue	McGill Pain Questionnaire (MPQ)
	Change in blood pressure, body mass index (BMI) or other physiological parameters
Mental health/ill health	General Health Questionnaire (GHQ-12)
e.g. depression, anxiety	RAND Mental Health Inventory (MHI)
	Hospital Anxiety and Depression Scale (HADS)
	Warwick-Edinburgh Mental Well-being Scale
General health/ill health	UK Census style measures of general health and limiting long-term illness

Secondary outcomes

We extracted data on sickness absence, health service usage and health/lifestyle behavioural effects when reported alongside the primary outcomes (for examples see Table 2). These outcomes are reported as secondary rather than primary health outcomes as it is recognised that these types of outcomes may not be reliable proxies of employee health/ill health due to the range of possible confounders involved. For example, sickness absence is thought to be affected by a range of factors such as job satisfaction, personality traits, work-home interference, childcare arrangements, cultures of presenteeism and local norms about the social acceptability of sickness absence (Moreau 2004).

We also extracted outcomes relating to social wellbeing, specifically work-life balance, but only when reported alongside primary outcomes and when work-life balance was measured using a validated instrument. It is acknowledged that there are limitations associated with the subjective nature of measurements of work-life balance. Work-life balance is conceptualised here in terms of the impacts of the interventions on social and domestic life, for example time spent with family or sufficient time for social life (Bambra 2008b). Possible measures of work-life balance included work related reduction/increase in time spent on domestic chores/social life/family or any kind of social/domestic disruption due to work. We also extracted data on outcomes relating to the effects of flexible working interventions on the health and wellbeing of children and family members and co-workers when measured using a validated instrument and reported alongside primary outcomes.

We noted but did not extract data pertaining to organisational and economic outcomes, such as staff turnover rates, job performance, job satisfaction and employee morale, in this review as we were interested, specifically, in the impact of flexible working on employee health and wellbeing. Organisational outcomes including productivity, performance, job satisfaction and satisfaction with work schedule have been considered in an earlier meta-analysis by Baltes 1999.

Table 2: Examples of secondary outcomes measured

Secondary outcomes	Possible examples of measurements
Sickness absence (by cause if available)	Employer records Self-reporting
Health service usage	Self-reporting, e.g. GP visits, hospital stays
Lifestyle/behavioural changes	Self-reporting, e.g. increased time spent at the gym or doing exercise/sport; changes in smoking behaviours, alcohol/drug consumption, changes in diet (e.g. consumption of fast food)
Quality of life	EORTC (European Organisation for Research and Treatment of Cancer) Quality of Life Questionnaire Functional Limitations Profile (FLP) Short Form (SF-36) EuroQol (EQ-5D)
Work-life balance	Social/domestic disruption/interference Family-to-work conflict Time spent with friends/family Time spent on domestic chores/hobbies
Social wellbeing	Health and wellbeing of children and family members Health and wellbeing of co-workers

Search methods for identification of studies

Electronic searches

We conducted systematic searches using the following 12 electronic databases (host sites and search dates given in parentheses): the Cochrane Public Health Group Specialised Register (26 June 2009); the Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library* 2009, issue 2) (1 July 2009); MEDLINE (Ovid, 30 March 2009); EMBASE (Ovid, 1 May 2009); CINAHL (NHS Evidence Health Information Resources, 13 May 2009); PsycINFO (NHS Evidence Health Information Resources, 15 May 2009); Social Science Citation Index (Web of Science,

22 May 2009); ASSIA (CSA, 16 June 2009); IBSS (EBSCO, 19 June 2009); Sociological Abstracts (CSA, 16 June 2009); ABI/Inform (Proquest, 21 May 2009); Evidence for Policy and Practice Information and Co-ordinating (EPPI) Centre; and Evidence Library of Reviews (22 June 2009). The search concepts were combined as follows: Interventions (flexible working interventions) AND Setting (workplace/workers) AND Outcomes (relating to health and wellbeing). We did not exclude documents on the basis of language, country or publication date. The individual search strategies are reproduced in Appendix 1.

Searching other resources

We handsearched the bibliographies of all included studies (as well as excluded but closely related studies, that is studies of the effects of a flexible working intervention on health which did not use a CBA design), and requested relevant information on unpublished and in-progress research from study authors and key experts in the field. This involved contacting the authors of all included and excluded but closely related studies. The number of key experts contacted snowballed, as contact with one author signposted the need for communication with additional experts in the field. In addition, we handsearched the most common journals revealed by searches (including *Journal of Epidemiology and Community Health*; *Scandinavian Journal of Work, Environment and Health*; *Journal of Occupational and Environmental Medicine*; *American Journal of Preventive Medicine*; and *Ergonomics*) for the past 12 months (July 2008 to July 209). We also searched the following English language websites:

- Department of Work and Pensions (http://www.dwp.gov.uk);
- Department of Health (http://www.dh.gov.uk);
- Department for Business Enterprise and Regulatory Reform (http://www.berr.gov.uk);
- Trade Union websites (including http://www.tuc.org.uk/; http://www.dol.gov/; http://www.actu.asn.au/; http://www.canadianlabour.ca/home)
- Confederation of British Industry (http://www.cbi.org.uk);
- Joseph Rowntree Foundation (http://www.jrf.org.uk/);
- European Union (http://europa.eu/index_en.htm);
- World Health Organization (http://www.who.int/en/);
- Guideline sites (National Institute for Health and Clinical Excellence (NICE, http://www.nice.org.uk/), Scottish Intercollegiate Guidelines Network (SIGN, http://www.sign.ac.uk/); and
- European Foundation for the Improvement of Living and Working Conditions (http://www.eurofound.europa.eu/).

We also consulted Peter Schnall's job stress network for signposts to relevant studies: http://www.workhealth.org/. The importance of supplementary searching in relation to this topic area has been illustrated in two related systematic reviews of shift work (Bambra 2008a; Bambra 2008b) which showed that after searching 27 different databases, 40 out of 66 studies were identified through MEDLINE or EMBASE and half of the remainder were located through citation follow up (Bambra 2009c).

Data collection and analysis

Selection of studies

Two authors (KJ and CB) independently screened the title and abstract for relevance of all publications identified by the searches. The inclusion criteria were: (i) randomised controlled trial, interrupted time series or controlled before and after study; (ii) physical, mental or general health/ill health measured using a validated instrument; and (iii) length of follow up six months or greater. Where it was difficult to make a selection decision on the basis of the title and abstract alone, we retrieved the full article for screening. We recorded the reason for exclusion of studies which appeared to fulfil the eligibility criteria systematically (see Characteristics of excluded studies).

Data extraction and management

Two experienced systematic reviewer authors (KJ and RP) extracted data from studies meeting the inclusion criteria independentlyusing a standardised form (see Appendix 2) adapted from the Cochrane checklist (Higgins 2008a). Any discrepancies were resolved through discussion between the authors and if consensus was not reached with a third author (CB). We then entered the extracted data into the Characteristics of included studies tables (RevMan 2008).

Assessment of risk of bias in included studies

Given the complexity of the interventions and the need to consider controlled before and after studies due to the absence of randomised controlled trials in this area, we deemed the Cochrane endorsed system of domain based risk of bias evaluation (Higgins 2008b) to be inappropriate. Instead we appraised the methodological quality of included studies using a tool (see Appendix 3) which has previously been employed in related reviews of the health effects of complex social interventions (Bambra 2008a; Bambra 2008b; Bambra 2007; Egan 2007). The tool is based on established guidance for the evaluation of non-randomised studies (CRD 2001; Deeks 2003). Two authors (KJ and RP) independently appraised the included studies according to these criteria which included, among other things, an examination of sampling strategy, response and follow-up rates, and assessment of adjustment for confounders such as demographic, lifestyle or job content factors. We used the quality appraisal criteria for descriptive purposes and to highlight variations between studies and we calculated no quality score. Any differences in assessment were resolved through discussion with the third author (CB).

Dealing with missing data

We contacted study authors by email if methodological details or statistical data were missing and in the instance that further information regarding methodology could not be retrieved, we recorded details as unclear in the data extraction and critical appraisal forms.

Assessment of heterogeneity

Earlier reviews in this area identified considerable heterogeneity in terms of populations, outcomes and study designs (Bambra 2008a; Bambra 2008b). In this review the studies identified were not considered to be sufficiently homogenous (that is, in relation to population, intervention, control group, outcome measure and design) to enable meta-analysis to be undertaken. We

identified only a small number of studies for each flexible working intervention and few studies used the same primary and secondary outcome measures. By way of illustration, six different flexible working interventions were considered, meaning that in only two instances more than one study was retrieved per intervention type (self-scheduling (n = 4) and gradual/partial retirement (n = 2)). In relation to the studies on self-scheduling there were no shared outcomes measured using validated instruments that could be pooled (see Summary of findings for the main comparison). Although two studies (Kandolin 1996 and Pryce 2006) considered the outcome 'stress' they used different instruments and constructed this outcome in different ways: the former referred to mental stress (measured in the Occupational Stress Questionnaire, Elo 1992) while the latter measured stress symptoms, using three validated four-item scales: behavioural cognitive and somatic symptoms (developed by Setterlind 1995). Equally, the two studies on gradual/partial retirement assessed different validated health outcomes (general health status (de Vaus 2007) and depression (Calvo 2009) (see Summary of findings 2).

Data synthesis

A meta-analysis was precluded due to the heterogeneity of the studies, particularly in terms of the interventions and the outcome measures used. Deeks 2008 warns against the use of meta-analysis in the instance that the statistical combination of results is unlikely to give meaningful results, for example if study outcomes are highly diverse. In addition, the pooling of effect sizes of studies where risk of bias is identified is likely to produce erroneous results (Deeks 2008). While we recognise that there is an element of subjectivity in decision-making regarding the appropriateness of meta-analysis (Deeks 2008), we believe that the reasons listed above justify the use of narrative synthesis to summarise results in this particular review. In our narrative synthesis we reported study findings separately by type of flexibility intervention and described the main characteristics of included studies along with information regarding the study quality and estimates of effect with relevant statistics. To avoid introducing bias into the narrative synthesis, we reported the results of each study judiciously and made efforts to avoid inappropriate emphasis on the findings of any one particular study or author (Deeks 2008).

Subgroup analysis and investigation of heterogeneity

We contacted the authors of all included studies to determine whether unpublished data on differential outcomes by socio-economic status or demographic characteristics were available. The rationale for undertaking subgroup analyses by age is underpinned by the recognition that the population of many industrialised countries is ageing and flexible working arrangements may be significant for older workers. Similarly, it is important to understand the socio-economic patterning of flexible working arrangements and the impacts such inequalities might have on health and wellbeing. For example, shift work tends to be more common in manual occupations and workers employed in the manufacturing and healthcare sectors (McOrmond 2004; Siegrist 2009). Equity implications (Ueffing 2008) have also been highlighted in relation to gender and ethnicity as women and ethnic minorities tend to be overrepresented in jobs with flexible conditions (Need 2005). For these reasons subgroup analyses were planned but (with the exception of one study which provided data by gender) were not undertaken due to an absence of data.

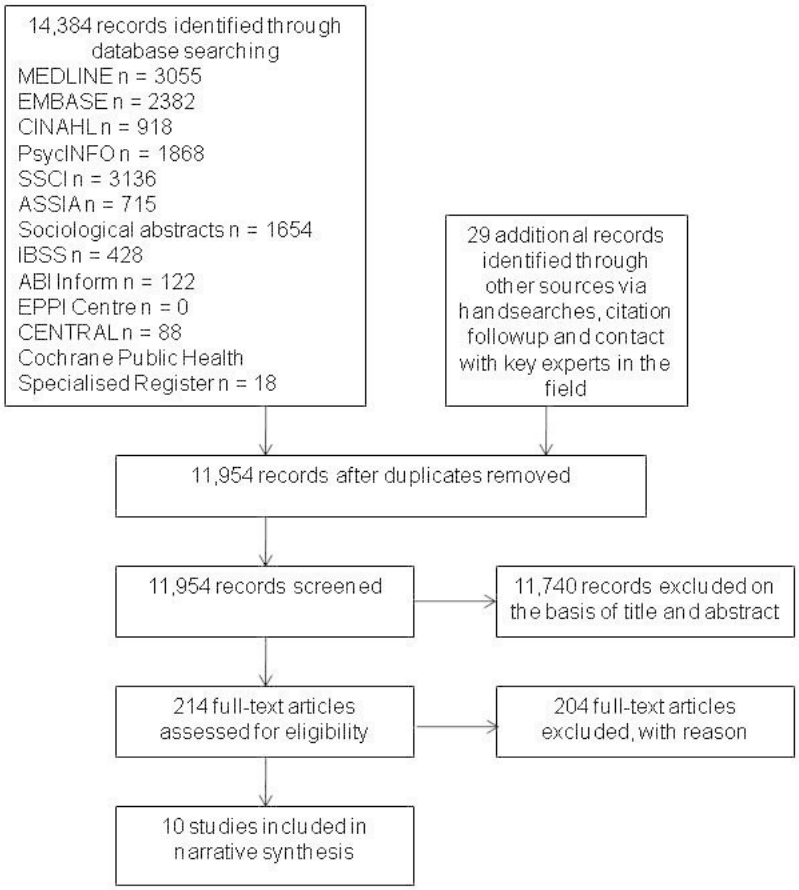
RESULTS

Description of studies

See: Characteristics of included studies; Characteristics of excluded studies; Characteristics of ongoing studies.

Electronic searches of 12 databases yielded 14,384 hits. Citation follow up, handsearches and author/key expert contact generated an additional 29 publications which, when combined with the electronic searches, left 11,954 papers after duplicates were removed. In total, 214 publications (185 from the electronic databases and 29 from additional searches) relating to flexible working were retrieved for full paper analysis (see Figure 1). Only 10 publications fulfilled our inclusion criteria in that they examined a flexible working intervention (as listed in Box 1), used a suitable study design with a follow-up period of at least six months, and reported on primary health outcomes using a validated instrument. Of these, four papers were retrieved from MEDLINE (De Raeve 2007; Kandolin 2001; Rodriguez 2002; Viitasalo 2008), one paper was identified in PyscINFO (Dunham 1987), one from Social Science Citation Index (Calvo 2009) and one paper was found in the Cochrane Central Register of Controlled Trials (CENTRAL) (Pryce 2006). We identified a further three papers through citation follow up (de Vaus 2007; Dooley 2000; Smith 1998). Contact with experts in the field highlighted an additional two ongoing studies (Garde 2008-2011; Nabe-Nielsen 2006-2010) which are listed in the Characteristics of ongoing studies table but are not data extracted or appraised. Searches of EMBASE, CINAHL ASSIA, IBSS, Sociological Abstracts, ABI/Inform, EPPI Centre, Evidence Library of Reviews and the Cochrane Public Health Group Specialised Register did not yield any hits that satisfied our specific inclusion criteria. Likewise, we retrieved no relevant publications fulfilling our inclusion criteria from the website searches. The reasons for excluding studies which appeared to fulfil the eligibility criteria but were excluded after full paper analysis are listed in the Characteristics of excluded studies table.

Figure 1. Flowchart of search process



Type of flexible working interventions

Ten controlled before and after studies, involving 16,603 participants were included. Of the 10 publications fulfilling our inclusion criteria, six reported on interventions relating to temporal flexibility: self-scheduling/flexible scheduling of shift work (n = 4), flexitime (n = 1) and overtime (n = 1). The remaining four studies considered a form of contractual flexibility: gradual/partial retirement (n = 2), involuntary part-time work (n = 1) and fixed-term contract (n = 1). No studies fulfilling the review inclusion criteria were found on either teleworking (spatial flexibility) or job sharing (contractual flexibility).

Regarding the type of flexibility associated with the interventions, seven of the studies considered changes that appeared to be motivated with the worker in mind (either to improve health, work-life balance or the psychosocial work environment) (Calvo 2009; de Vaus 2007; Dunham 1987; Kandolin 1996; Pryce 2006; Smith 1998; Viitasalo 2008). Conversely, two studies reported on interventions where the motivation for the intervention aligned more with organisational or employer interests (Dooley 2000 (involuntary part-time contracts); Rodriguez 2002 (fixed-term contracts)). In one study (De Raeve 2007) where the intervention involved a transition from working no overtime to overtime working, it was unclear as to whether the workers elected to work overtime or whether overtime was dictated by the employer. Few papers gave detailed information regarding the motivation for, or the objectives of, the interventions, for example whether or not they were developed in response to policy initiatives or alternatively whether they were implemented for economic reasons. There were two exceptions: a study by Kandolin 1996 provided some details regarding how the intervention was designed and implemented and a study by Pryce 2006 included a good level of detail on the study context. None of the studies provided information on whether or not worker representative organisations were involved in the development and/or delivery of the interventions.

Characteristics of setting and participants

All of the studies were conducted in the developed world, with the majority of studies taking place in Europe (Denmark n = 1; Finland n = 2; UK n = 1; UK and Germany n = 1; the Netherlands n = 1) or the United States (n = 3). One further study was conducted in Australia. We located no studies conducted in low or middle-income countries. The studies were based in various occupational settings: healthcare organisations (n = 2); the police force (n = 1); a utilities organisation (office workers) (n = 1); airline company (line maintenance workers) (n = 1); and the general working population/various companies or organisations (n = 5). The majority of studies involved homogenous samples in terms of sex and ethnicity. For further details regarding the study populations and settings see Characteristics of included studies.

Risk of bias in included studies

The representativeness of the study sample was satisfactory in all but five studies (De Raeve 2007; Dunham 1987; Pryce 2006; Smith 1998; Viitasalo 2008). De Raeve 2007 noted that the cohort used did not constitute a representative sample of the working population and studies by Pryce 2006 and Viitasalo 2008 involved self-selection of participants. In studies by Dunham 1987 and Smith 1998 the process of sampling was unclear. Concerns regarding the appropriateness of the control group were apparent in relation to three studies (Kandolin 1996; Smith 1998; Viitasalo 2008). Very low baseline response rates (less than 60%) were noted in two of the included studies (De Raeve 2007; Viitasalo 2008) and response rates were unclear in a further seven studies (Calvo 2009; de Vaus 2007; Dooley 2000; Dunham 1987; Pryce 2006; Rodriguez 2002; Smith 1998). Adequate follow-up rates (greater than 80%) were reported in only four studies (Dooley 2000; Dunham 1987; Pryce 2006; Viitasalo 2008). Where details of the method were unclear, the study authors were contacted for clarification of methods used but no responses were received.

The short follow-up periods (12 months or less) employed in five of the studies reviewed (Dunham 1987; Kandolin 1996; Smith 1998; Rodriguez 2002; Viitasalo 2008) may not be sufficient to detect clinical changes, for example changes in biomarkers of cardiovascular disease or accumulated fatigue and stress. In the study by Kandolin 1996 comparison of the control and experimental groups at baseline showed that the groups differed in relation to social conflict, with the control group having a higher score for conflict between workmates (P = 0.03). In two studies (Dunham 1987; Pryce 2006) there were no data or only sparse data presented to assess the possibility of baseline differences between the experimental and control groups in terms of demographics, health status and flexible working experience. However, seven studies did account for differences between the intervention and control groups at baseline (Calvo 2009; De Raeve 2007; de Vaus 2007; Dooley 2000; Rodriguez 2002; Smith 1998; Viitasalo 2008).

The risk of self-reporting bias affected all but one study (Viitasalo 2008), where experimental physiological measures were used to assess some of the health outcomes. Limitations relating to outcome data in the form of misclassification bias were also of concern in a study by De Raeve 2007 in which an arbitrary cut-off point was used to classify cases of 'need for recovery'.

In the study by Pryce 2006 there was a clear risk of contamination as five concurrent interventions to enhance work and wellbeing were ongoing at the study site during the same period. It is possible, since the authors make no reference to protection against contamination, that participants in the control group may have been affected by these other interventions, thus biasing the intervention effect towards the null hypothesis (that is that flexible working has no effect on health outcomes). Concerns regarding the appropriateness of the statistical tests employed in the study analyses were apparent in the study by Dunham 1987.

Importantly, there was no adjustment for potentially confounding factors such as demographic or lifestyle variables, job content or flexible working experience in three of the included studies (Dunham 1987; Kandolin 1996; Pryce 2006). Smith 1998 drew attention to the effect of motivational issues (that is whether or not workers support the intervention) on the acceptance and adjustment to work schedule changes. This type of bias (the Hawthorne effect) is likely to confound the findings of at least four of the studies reviewed (Dunham 1987; Kandolin 1996; Pryce 2006; Smith 1998) which use self-reported outcome data and is difficult to control for when evaluating a complex intervention such as flexible working.

The remaining studies (Calvo 2009; de Vaus 2007; Dooley 2000; Rodriguez 2002) scored highly in terms of methodological quality with representative samples, good response and follow-up rates, adequate adjustment for relevant confounders, adjustment for drop-out and use of appropriate statistical tests, but the appraisal process did highlight some concerns relating to possible misclassification bias in two of these studies (Calvo 2009; de Vaus 2007). Both studies examine a form of contractual flexibility (gradual/partial retirement) but exposure data are ascertained by self-report with no checking mechanism and the definition of cases is complex leading to the possible incorporation of error.

In summary, the main sources of bias in the included studies were short follow-up periods, reliance on self-reported outcomes and limited adjustment for confounding factors such as demographic variables, job content or flexible working experience. These limitations were coupled with a sparse level of detail reported on study methodology making it difficult to ascertain whether or not study samples were sufficiently representative and control groups were adequately matched and whether or not there were any differences between intervention and control groups at baseline.

Table 3: Quality appraisal of evidence

Study	Type of flexibility	Employer/worker-orientated	Intervention type	Quality appraisal of evidence (see key below)
De Raeve 2007	Temporal	Unclear but likely to be employer orientated	Overtime	2, 6, 7, 8, 9
Dunham 1987	Temporal	Worker	Flexitime	2, 4, 5, 6, 8
Kandolin 1996	Temporal	Worker	Self-scheduling of shifts	1, 3, 6, 8, 9
Pryce 2006	Temporal	Worker	Self-scheduling of shifts	2, 4, 5, 6, 9

Smith 1998	Temporal	Worker	Compressed working week with flexibility regarding start/finish times	6, 7, 8, 9
Viitasalo 2008	Temporal	Worker	Self-scheduling of shifts	4, 5, 6, 7, 8, 9
Calvo 2009	Contract	Worker	Partial retirement	1, 2, 5, 6, 7, 8, 9
de Vaus 2007	Contract	Worker	Partial retirement	1, 2, 6, 7, 8, 9
Dooley 2000	Contract	Employer	Involuntary part-time	1, 2, 4, 6, 7, 9
Rodriguez 2002	Contract	Employer	Fixed-term contract	1, 2, 5, 6, 7, 8, 9

*Key: Quality appraisal criteria**

1	Is there a representative sample (e.g. random samples, adequately justified purposive sampling, or 100% samples)?
2	Is there an appropriate control group (e.g. random allocation, matched control)?
3	Is the baseline response greater than 60%?
4	Is the follow up greater than 80%?
5	Have the authors adjusted for non-response and drop-out?
6	Are the authors' conclusions substantiated by the data presented?
7	Is there adequate adjustment for the majority of known confounders (e.g. demographic, lifestyle, job content, flexible working experience)?
8	Is there protection against contamination between the intervention and control groups?
9	Were appropriate statistical tests used?

** The numbers 1 to 9 represent satisfactory fulfilment of the corresponding criterion. Where it is unclear from the study whether a quality criterion has been achieved no score is given.*

Effects of interventions

See: **Summary of findings for the main comparison** Summary of findings: primary health outcomes - temporal flexibility; **Summary of findings 2** Summary of findings: primary outcomes - contractual flexibility; **Summary of findings 3** Summary of findings: secondary outcomes - all flexibility types

Primary outcomes

For more detailed statistical information on effects in relation to primary outcomes see Summary of findings for the main comparison and Summary of findings 2.

Interventions offering temporal flexibility

Flexitime

Only one controlled before and after study fulfilling our inclusion criteria examined the impacts of flexitime on workers (Dunham 1987). This flexitime intervention involved working a core period between 1.30pm and 3.30pm, but with flexibility regarding start and finish times and timing and duration of lunch breaks. Workers were required to plan their schedules one week in advance and supervisors could request changes to facilitate departmental functioning. The study was conducted in a population of office workers (n = 102), which consisted of both supervisory and non-supervisory personnel and the setting was the United States. Subjects were randomly assigned to the experimental or control group and self-rated physiological and psychological health was measured using a seven-item, scale validated by Patchen 1970.

No changes were noted between the experimental or control group over time (Dunn Bonferroni statistics for physiological stress pretest and first post-test: -0.487 pretest and second post-test: -0.708, second and first post-test: -0.262. Dunn Bonferroni statistics

for psychological stress: pretest and first post-test: -0.757, pretest and second post-test: -0.778, second and first post-test: -0.099).

Self-scheduling

Four controlled before and after studies examined the effects of self-scheduling on shift workers (Kandolin 1996; Pryce 2006; Smith 1998; Viitasalo 2008). Three of these studies reported significant improvements in a subset of primary health outcomes while the fourth study reported no statistically significant differences between the control and intervention groups over time with respect to the primary health outcomes studied (Pryce 2006).

Viitasalo 2008 considered the effects of flexibility of shift scheduling in a study conducted in a line maintenance unit of a Finnish airline company. The flexibility delivered in the intervention aimed to benefit the worker, principally, by increasing individual flexibility and control over work hours but also the employer, by encouraging variability in shift schedules to take account of changing operational needs. Schedules were issued four weeks in advance and the employer was unable to make changes in the first two weeks of the rotas without negotiation with the workers and suitable compensation. As well as a comparison group which retained the old shift system, a third group changed to a rapidly forward rotating shift system (a rapid forward rotating system is characterised as one which rotates in a clockwise direction from morning (M), to evening (E), to night (N) shifts and the cycles of change are more rapid (change from EEE - - MMM - - NNN - - to MEN - -)). Physiological measures (that is, non self-reported measures) were used to examine health related outcomes (change in blood pressure, heart rate and biomarkers of cardiovascular disease) and validated instruments were used to measure general health-related outcomes (sleepiness using the Epworth Sleepiness Scale (ESS), Johns 1991) and secondary outcomes (physical activity using the International Physical Activity Questionnaire). The authors reported significant decreases in systolic blood pressure in the experimental group when compared with the comparison groups. Decreases in systolic blood pressure are known to be associated with a reduction in the risk of stroke and ischaemic heart disease. Mean systolic blood pressure in the intervention group decreased from 142 mm Hg to 136 mm Hg (P = 0.049) and heart rate showed a decreasing trend from 66 to 60 beats/minute which persisted when compared with the control groups (P = 0.06). Changes in diastolic blood pressure were non-significant (numerical data reported graphically only). Likewise, changes in the ESS scale decreased but the changes were not statistically significant when compared with the control groups (the ESS score in the experimental group decreased from 7.5 (SD 5.3) to 7.1 (SD 4.4) while the control group ESS score increased from 7.8 (SD 3.8) to 8.3 (SD 3.9)).

Smith 1998 looked at the effects of flexibility within a compressed working week (CWW) shift system in the UK police service. The intervention enabled police officers to take flexible starts while working four 12-hour shifts followed by four days off and was implemented with the aim of improving workers' work-life balance by allowing participants to negotiate shifts to fit with domestic life. The comparison group was on fixed-start 12-hour shifts. Both intervention and comparison group had previously worked eight-hour shifts with fixed starts. A range of physical and mental health outcomes, as well as work-life balance, were measured using validated instruments including the General Health Questionnaire (GHQ-12, Goldberg 1972) and the Standard Shiftwork Index (Barton 1992). When the flexible CWW was compared to the fixed CWW no significant changes were reported for physical health measures. However, a significant interaction effect on psychological wellbeing was found (F = 5.11, P < 0.05) with mental health improving on the flexible system and deteriorating on the fixed rota system. Interaction effects were also observed for day shift sleep quality (F = 4.59, P < 0.05) and night shift alertness (F = 4.21, P < 0.05) and night shift sleep durations (F = 6.49, P < 0.05). No significant interaction effect was observed for day shift alertness (F = 1.75, P > 0.05) or night shift sleep quality (data not given).

Pryce 2006 examined the effects of an open rota scheduling system implemented in a psychiatric hospital in Denmark on a range of health and wellbeing outcomes. This was one of only two controlled before and after studies located which provided comprehensive details of how the flexible working intervention was operationalised (the other study with implementation details is by Kandolin 1996). A participatory approach underpinned how the self-scheduling system was conceived, designed, implemented and evaluated and the motivation for the intervention was transparent: to improve levels of health, wellbeing, job satisfaction and work-life balance of nursing staff. Well-validated measures of health outcomes included: stress symptoms (three four-item scales of behavioural, cognitive and somatic symptoms (Setterlind 1995); global self-rated health (Borg 2000) and vitality (four-item scale, Setterlind 1995). No significant benefits to health were found when comparing the experimental and control groups over time, although non-significant trends were noted for somatic symptoms and vitality. For somatic symptoms the mean score for the control group increased from 34.75 (SD 10.81) to 38.45 (SD 10.75) whereas the corresponding change in the intervention group was much smaller, 33.53 (SD 13.33) to 34.33 (SD 13.65), F(175) = 1.25. Scores for vitality improved in the intervention group from 54.47 (SD 15.90) to 56.67 (SD not reported) whereas in the control group vitality scores decreased from 63.50 (SD 16.23) to 57.36 (SD 17.36) F(174) = 1.72.

Multiple intervention study

Kandolin 1996 reported on a multiple intervention study which included changes to the direction and speed of shifts as well as the introduction of self-scheduling. The intervention was explicitly designed to reduce workers' levels of fatigue. Mental health (mental strain and mental stress) and general health (tiredness) outcomes were recorded using the Standard Shiftwork Index (Barton 1992) and the Occupational Stress Questionnaire (Elo 1992). Subjects were midwives (100% female) and the setting was a hospital in Finland. In terms of general health outcomes, a significant decrease in tiredness during the night shift (from 53% to 44% in the intervention group) was demonstrated with a time x group interaction P = 0.02. No significant differences in mental health outcomes were reported although non-significant reductions in three primary health outcomes were experienced in the intervention group: mental stress (from 27% to 15%, P = 0.07); mental strain in the morning shift (from 27% to 11%, P = 0.09); mental strain in the evening shift (from 17% to 9%, P = 0.29). Since self-scheduling was part of a multiple intervention, the findings are subject to the caveat that it is not possible to separate out the effects of each of the concurrent interventions.

Overtime

One study considered the impacts of overtime working on health and wellbeing. De Raeve 2007 examined changes in overtime in a

population of blue and white collar workers in various settings. No subgroup analyses by job type were undertaken but the authors did explore the results by gender. When comparing workers who moved from working no overtime at baseline to working overtime at follow up they found no statistically significant associations between overtime work and need for recovery or psychological distress in either men or women. (Need for recovery from work refers to the extent that work tasks induce a need to recuperate from work induced effort (characterised by emotional cognitive and behavioural symptoms). Need for recovery was measured using an 11-item scale from the Dutch Questionnaire on the Experience and Evaluation of Work (VBBA) and cases of need for recovery were classified as those scoring in the upper tertile on the VBBA scale (van Veldhoven 2003). For men after undertaking overtime work the odds of becoming a need for recovery case were 1.31 (95% CI 0.87 to 1.98) and the odds of men becoming a psychological distress case were 1.16 (95% CI 0.83 to 1.64). Equally for women, after undertaking overtime work the odds of becoming a need for recovery case or a psychological distress case were also non-significant: OR 1.47 (95% CI 0.64 to 3.38) and OR 0.81 (95% CI 0.40 to 1.62) respectively. They also examined workers making the transition from working overtime at baseline to not working overtime at follow up and found that after adjusting for known confounders there was an increased risk of being a need for recovery case at follow up. The authors explain this unexpected and counterintuitive observation by suggesting that if overtime is at the discretion of the employer and it is not made available for economic reasons then workers may have to increase their productivity during normal work hours and therefore might be under greater levels of stress and strain leading to increased scores for need for recovery. Indeed, when comparing male participants who worked overtime at both time points with those not working overtime at either time point, the risk of being a psychological distress case or a need for recovery case was significantly lower in those working overtime (psychological distress case OR 0.69 (95% CI 0.49 to 0.98) and need for recovery case OR 0.58 (95% CI 0.36 to 0.93)). These findings are limited, however, in that health outcomes are measured after a transition to overtime and there is no data on the amount of overtime worked (i.e. overtime hours per week) and the temporal duration of overtime working (the period may be less than six months). Also, we have no information on past exposures, for example although participants state that they were not working overtime at baseline we cannot ascertain whether they had recently worked overtime from the data collected. The authors did attempt to capture this information using an item within the questionnaire on whether the change in work hours was at the employee's request but response to this particular item was low. It is therefore unclear as to whether overtime working was dictated by the employer or requested by the worker.

Interventions offering contract flexibility

Four studies considered contract flexibility interventions (Calvo 2009; de Vaus 2007; Dooley 2000; Rodriguez 2002).

Partial/gradual retirement

Two studies fulfilling our inclusion criteria were identified on partial or gradual retirement (Calvo 2009; de Vaus 2007), both of which compared participants retiring gradually with those who retired abruptly. The study by Calvo 2009 used data from the Health Retirement Study, a nationally representative survey conducted in the United States between 1992 and 2004. The authors examined the mental health outcome depression using a validated instrument (Diener 1999; Frey 2002; Perreira 2005; Veenhoven 1991) with a maximum follow-up period of 12 years. Calvo 2009 found no significant changes in depression for either the gradual or the abrupt retirement group between time points. For individuals in the gradual retirement group, mean depression score was 0.120 (SD 0.326) before and 0.165 (SD 0.371) after the transition. Similarly, for those in the control group mean depression was 0.118 (SD 0.322) before and 0.149 (SD 0.357) after abrupt retirement. However, the authors suggested that the effects of retirement (both partial and abrupt) on health were related to whether retirement was forced or voluntary, that is whether or not the individual had control over their choice.

de Vaus 2007 used data from an Australian study (the Australian Healthy Retirement Project) spanning three years (1998 to 2001) and examined general health status and a range of mental health indicators measured using validated tools: positive affect (Lawton 1992), negative affect (Lawton 1992) and self-image (Adelmann 1994; Rosenberg 1965; Scheier 1985). The authors reported a significant improvement in health at 12 months follow up for participants retiring gradually when compared with the control group (Beta coefficient 0.14, P < 0.01) but this effect disappeared at 36 months (Beta coefficient 0.04, P > 0.05). There were no significant differences between gradual and abrupt retirees in the following mental health outcomes: levels of positive affect (Beta coefficient -0.04 at 12 months, 0.03 at 36 months), negative affect (Beta coefficient -0.02 at 12 months, -0.02 at 36 months) and self-image (Beta coefficient -0.02 at 12 months, -0.03 at 36 months. The authors also examined the degree of control over retirement pathway but these models did not compare gradual with abrupt retirees and the two groups were pooled.

Both Calvo 2009 and de Vaus 2007 found that control over retirement was related to better health outcomes. Calvo 2009 found that having control over retirement had a significant effect on depression scores (coefficient -0.470, P < 0.01) when comparing those retirees with control and those without control. de Vaus 2007 found that at 12 months follow-up, participants with greater control over their retirement decision had significant increases in positive affect (Beta coefficient 0.12, P < 0.01), decreases in negative affect (Beta coefficient 0.15, P < 0.01) and improvements in self-image (Beta coefficient 0.19, P < 0.001). These effects attenuated at 36 months follow up. The authors also considered the interaction between retirement pathway and degree of control and found that the following interaction terms were significant: change in positive affect at 36 months (Beta coefficient -0.38, P < 0.05) and change in negative affect at 12 months (Beta coefficient -0.38, P < 0.05). The group exhibiting the smallest improvement in either score was the low control, abrupt retirement group.

Involuntary part-time employment

Multiple intervention study

A study by Dooley 2000 considered the effects of involuntary part-time employment on psychological functioning as measured using the Center for Epidemiologic Studies Depression Scale (CES-D). Becoming inadequately employed was associated with increased depression when compared with remaining adequately employed and after adjusting for depression at baseline (b = 0.67, Beta = 0.04, t = 2.80, P < 0.05). This association remained significant after controlling for family poverty status and marital status (b = 0.71, Beta = 0.04, t = 2.98, P < 0.05). However, the authors pooled

participants on involuntary part-time contracts with those working on a poverty wage into a group categorised as inadequately employed. It is therefore not possible to disentangle the effects of involuntary part-time employment from employment on a poverty wage.

Fixed-term employment

A study by Rodriguez 2002 looked at the effects of fixed-term employment compared with permanent employment on self-reported health status. Data from the Household Panel Comparability Project from Britain and Germany (1991 to 1993) were used to examine the impact of change in employment stability (from permanent to fixed-term contract) over time. Perceived health status as validated by Bjorner 1996 was the dependent variable under investigation here. In both Britain and Germany no statistically significant differences were noted in perceived health status (likelihood of reporting of fair, poor or very poor health) in those moving from permanent contract at baseline to fixed-term or no contract at follow up when compared with those with permanent contracts at both time points. In Britain and Germany the odds of having no permanent contract at follow up were OR 0.73 (95% CI 0.42 to 1.28) and OR 0.81 (95% CI 0.44 to 1.53) respectively.

Interventions offering spatial flexibility

Teleworking

No studies meeting our inclusion criteria were found for teleworking interventions.

Secondary outcomes

For more detailed statistical information on effects in relation to secondary outcomes, see Summary of findings 3.

Four of the ten studies reviewed measured secondary outcomes as defined in this review (see Table 2, Examples of secondary outcomes measured). Measures of quality of life featured in two studies. Pryce 2006 used scales on sense of community and social support, and de Vaus 2007 incorporated a measure called life satisfaction. Work-life balance was also explored in two studies: one study (Smith 1998) used interference with social and family life to assess work-life balance, while the other study used marital cohesion (de Vaus 2007). Finally, lifestyle/behavioural changes such as physical activity levels and diet were measured by Viitasalo 2008. None of the studies reviewed here examined the effects of a flexible working intervention on sickness absence, health service usage or the health and wellbeing of children, family members or co-workers.

In a study of an open rota scheduling system (temporal flexibility) implemented in a psychiatric hospital in Denmark, Pryce 2006 measured the secondary outcomes, sense of community and social support (both from the Copenhagen Psycho-social Questionnaire, Kristensen 1998). Significant increases were observed for social support ($F(174) = 4.05$, $P = 0.001$) and sense of community ($F(176) = 4.44$, $P = 0.001$) when comparing the intervention and control groups before and after the self-scheduling system was implemented.

In a study of gradual/partial retirement, de Vaus 2007 used life satisfaction as a quality of life outcome measured using a scale validated by Campbell 1976. Similarly, marital cohesion (validated by Spanier 1976) was adopted as a work-life balance outcome. When comparing abrupt and gradual retirees the authors found no statistically significant differences in life satisfaction or marital cohesion over time. At 12-month follow up, participants with greater control over their retirement decision had significant increases in life satisfaction (Beta coefficient 0.15, $P < 0.01$). Similarly, at 36 months follow up participants with greater control over their retirement decision were more likely to report increases in marital cohesion (Beta coefficient 0.12, $P < 0.05$). The authors also considered the interaction between retirement pathway and degree of control and found that the interaction term change in marital cohesion was statistically significant at 36 months (Beta coefficient -0.53, $P < 0.05$). The group with the lowest marital cohesion scores was the low-control, abrupt retirement group.

In a study of a compressed working week intervention with flexible start and finish times (temporal flexibility), Smith 1998 measured work-life balance using the "interference with social and family life" item from the Standard Shiftwork Index (Barton 1995). Participants in the intervention or control groups did not differ in terms of interference with social and family life at follow up.

Viitasalo 2008 measured physical activity using the International Physical Activity Questionnaire (Craig 2003) and also recorded intake of alcohol, caffeine, fats and fibre in a study of a self-scheduling intervention. No significant differences in the interaction between time and group were observed for any of these lifestyle/behavioural changes.

Planned subgroup analyses

None of the included studies reported the effects of flexible working interventions on health and wellbeing by different subgroups on the basis of socio-economic status, job type, age or ethnicity. One study of overtime working (temporal flexibility) by De Raeve 2007 did report results differentially by gender but found no significant effect of overtime working on need for recovery or psychological distress in either males or females.

None of the studies conducted separate subgroup analyses by different types of worker, for example managerial or supervisory staff versus manual worker. In several studies managers/supervisors were pooled with general workers and analysed as a homogenous group (e.g. Viitasalo 2008). Similarly, analysis was not sex segregated or studies were conducted on single sex samples.

DISCUSSION

Summary of main results

We included ten CBA studies which examined six flexible working interventions (self-scheduling; flexitime; overtime; gradual/partial retirement; involuntary part-time employment; fixed-term contracts) relating to contractual and temporal flexibility. We identified no studies fulfilling the study design inclusion criteria on job shares (contractual flexibility) or on spatial flexibility interventions, specifically teleworking. Whilst remaining cognisant of the limitations of the review in terms of the ability to combine our findings and to make generalisations, we observed that studies examining the effects of temporal flexibility interventions tended to report at least some improvements in health and wellbeing outcomes (Kandolin 1996; Pryce 2006; Smith 1998; Viitasalo 2008) while contractual flexibility interventions (with the exception of gradual/partial retirement) reported equivocal or negative health

effects when comparing intervention and control groups before and after the interventions were implemented (Dooley 2000; Rodriguez 2002).

Due to heterogeneity in terms of study design and outcomes assessed it was not possible to undertake a meta-analysis. Based on a narrative synthesis of the study findings we tentatively suggest that interventions enabling flexibility which is orientated towards the worker and increases employee control over working conditions are likely to improve some aspects of health and wellbeing (Kandolin 1996; Smith 1998; Viitasalo 2008). Two other studies reporting on the effects of worker-orientated flexibility found no significant improvements in primary health outcomes but tellingly no negative health outcomes were observed (Dunham 1987; Pryce 2006) and positive effects on secondary outcomes, including quality of life, were seen in the study by Pryce 2006. Similarly, in the studies of gradual retirement, having control over the retirement decision was associated with improvements in the measured health outcomes (Calvo 2009; de Vaus 2007). Interventions which implemented employer-defined flexibility were either associated with no significant changes in health outcomes (De Raeve 2007; Rodriguez 2002) or, in one instance, adverse effects on mental health outcomes (Dooley 2000). Given the limitations associated with the size and quality of the evidence base these conclusions are made with caution.

In relation to secondary outcomes, only four of the included studies examined any of the following secondary outcomes: sickness absence, health service usage, health/lifestyle behavioural effects, work-life balance, health and wellbeing of children, family members and co-workers. Statistically significant effects were reported only in relation to improvements in social support and a sense of community in one study of self-scheduling of shifts (Pryce 2006). This intervention was also worker-orientated and enabled increased levels of control for the worker.

Since there was an absence of studies which conducted subgroup analyses it is unclear how flexible working impacts on health inequalities. Unfortunately this is a common problem for systematic reviews of the effects of interventions on health inequalities (Bambra 2009a). Future research should attempt to address this gap by differentiating outcomes by occupational grade or socio-economic group. Due to the social patterning of shift work, flexible working interventions like self-scheduling are likely to be relevant to workers from lower socio-economic groups and may have the potential to help to address the gap in health between low and high socio-economic groups (Bambra 2008b). Clearly more research is needed to explore this possibility further.

Box 2: Effects of the interventions on primary outcomes

Self-scheduling (four studies)

Three of four studies looking at the effects of self-scheduling reported that introducing flexibility into scheduling of shifts resulted in improvements in health outcomes. Kandolin 1996 reported significant reductions in tiredness during the night shift in workers in the experimental group when compared with the control group, although it should be noted that this study reported on the effects of multiple interventions. Smith 1998 demonstrated improvements in mental health, sleep quality on day shift, sleep duration on night shift and alertness during night shift for those individuals in the intervention group compared with the control group. Viitasalo 2008 found statistically significant decreases in systolic blood pressure for workers with flexible scheduling compared with those with fixed scheduling. Conversely, Pryce 2006 found no significant changes in primary health outcomes when comparing experimental and control groups although improvements in secondary outcomes were noted (see Box 3).

Flexitime (one study)

Flexitime was examined in only one study that met the specified review inclusion criteria (Dunham 1987). No significant differences between the intervention and control group were reported in relation to health outcomes.

Overtime (one study)

Only one study fitting our inclusion criteria was included that examined overtime working (De Raeve 2007). In this study overtime was not shown to affect either psychological stress or need for recovery significantly when comparing employees working overtime with those who did not. However, it should be noted that information on either the amount or duration of overtime was not available so it is therefore difficult to draw any conclusions regarding the effect of overtime on workers' health and wellbeing from this particular study.

Gradual/partial retirement (two studies)

Two studies considered the effects of gradual retirement on health compared with abrupt retirement. One study reported a significant improvement after gradual/partial retirement on general health status (de Vaus 2007). The results of the other study related to mental health outcomes, specifically depression, and were equivocal (Calvo 2009). Both studies demonstrated that control over retirement choice was significantly related to improved health outcomes.

Involuntary part-time employment (one study)

One study on the effects of involuntary part-time work on health found significant increases in depression in the intervention group compared with the control but these effects could not be attributed to involuntary part-time work as the authors pooled these participants with those on a poverty wage into a category referred to as underemployed (Dooley 2000).

Fixed-term contracts (one study)

No significant effects on health were found in the study that examined the impact of fixed term contracts on the health of workers when compared with workers with permanent contracts (Rodriguez 2002).

Box 3: Effects of interventions on secondary outcomes

Self-scheduling (three studies)

Two studies found no significant differences in the interaction between time and group for a number of measures defined as secondary outcomes in this review: interference with social and family life (Smith 1998); life style/behavioural changes including physical activity and dietary intake (Viitasalo 2008). One study (Pryce 2006) observed significant increases in social support and sense of community for workers in the intervention group compared with the control group over time.

Gradual/partial retirement (one study)

When comparing abrupt and gradual retirees, de Vaus 2007 found no statistically significant differences in life satisfaction or marital cohesion between the different retirement pathways over time.

Overall completeness and applicability of evidence

The evidence base was small with only ten controlled before and after studies of flexible working interventions fulfilling our inclusion criteria. No randomised controlled trial or time series analyses were retrieved. The small number of studies identified may indicate that publication bias is an issue here, where studies reporting equivocal or negative findings are less likely to be published. Many of the studies were undertaken in homogenous groups, such as female healthcare workers, so generalisability to the wider population is limited. No studies fulfilling our inclusion criteria were conducted in low or middle-income countries. This underlines an observation asserted in the Commission on Social Determinants of Health's final report to the WHO (Benach 2007) that few studies examining the relationships between work and health and the impacts on health inequalities have been conducted in developing countries.

Quality of the evidence

The studies retrieved which satisfied the inclusion criteria were limited in a number of methodological aspects. The follow-up period was 12 months or less in five of the studies so it was not possible to examine the longer term effects on physical, mental and general health. Regarding the suitability of the length of follow up, Jansen 2003 drew attention to differences in the length of time required before changes to health outcomes might be observed. They highlight that outcomes like fatigue are likely to develop relatively soon after an intervention has started whereas other health outcomes might take longer to emerge at a measurable level.

Concerns regarding whether or not the sample was representative were apparent in five studies and three studies did not use a matched or randomly allocated control group. With the exception of one study where experimental measures of blood pressure and biomarkers of cardiovascular disease were used (Viitasalo 2008), all of the studies used self-reported outcome data and the measurements varied widely between studies. The reliance on self-reported outcome data increases the possibility of confounding as in half (5/10) of the studies participants were aware of the study and its aims and in at least one instance (Pryce 2006) participants were involved in the design and implementation of the intervention. Three studies did not undertake suitable adjustment for potential confounding factors, such as demographic variables, lifestyle factors, job content and flexible working experience (Dunham 1987; Kandolin 1996; Pryce 2006). In addition, two of the reviewed studies (Dooley 2000; Kandolin 1996) reported on multiple interventions, making it difficult to separate out the effects of flexible working from other organisational changes.

Sparse data were included on the rationale for the interventions and on the implementation process. This is in line with an observation by Egan and colleagues that the implementation of complex interventions in the workplace is often poorly reported in primary studies (Egan 2009). Few studies presented important contextual information relating to why the intervention was developed, how it was planned and delivered and who were the intended beneficiaries. Crucially, there was a dearth of information on whether or not the intervention was designed to improve employee health, work-life balance or the psychosocial work environment or conversely whether the intervention was motivated by economic or other organisational interests. Similarly, none of the studies included adequate information on the presence or absence of employee, union or managerial support for the intervention and whether or not those implementing the intervention had appropriate experience and access to the necessary resources to deliver the intervention effectively.

Potential biases in the review process

Given the contested nature of the term 'flexible working', difficulties have arisen regarding establishing what is and what is not flexible working. Here we have taken as our point of departure the notion of choice and control as being of paramount importance but others may define flexible working more broadly by arguing that any working arrangement that deviates from the norm (for example, workplace based, 9 am to 5 pm, permanent contract employment) would constitute flexible working. Since this is the first review in the area a precise and restricted working definition has been operationalised but future systematic reviews might consider wider organisational changes including, for example, reduced working hours, compressed working weeks, and changes to the direction and speed of rotation of shift schedules.

Despite conducting searches across multiple electronic databases spanning biomedical, social science and business and management disciplines, it is possible that we have not been able to capture all studies published in the subject area. The findings of this review should, therefore, be interpreted with caution with the caveat that the studies were retrieved using the search strategy presented in Appendix 1 and by applying the inclusion criteria defined in the Methods section. Although the search strategy was developed in conjunction with an experienced information researcher and was piloted and checked by a Cochrane Information Researcher there are limitations regarding the sensitivity of the search strategy especially given the wide range of meanings attached to the term 'flexible working'. This problem is well-recognised for any review of complex and difficult-to-define interventions (Ogilvie 2005). While we did attempt to incorporate a diverse and representative range of terms and synonyms relating to flexible working it is likely that we have not captured all possible derivations of this generic term and may have missed specific colloquial or country-specific terms. It should be noted, however, that in order to capture any in progress research and to increase the sensitivity of the search process we also contacted key experts in the field, which identified an additional two in progress studies (see Characteristics of ongoing studies). Publication bias relating to commercial studies outside of the public domain may also limit conclusions regarding the size of the available evidence base. Further, it should be noted that although searches were conducted of relevant internet sites these were limited to English language only.

Agreements and disagreements with other studies or reviews

In line with an established body of research around the positive health effects of high levels of control in the workplace (Bosma 1997; North 1996; Stansfeld 1999), the findings of this review tentatively suggest that flexible working interventions that increase control and choice are likely to have a beneficial effect on at least some health and wellbeing outcomes. The studies of worker-orientated flexibility (specifically self-scheduling of shifts and gradual/partial retirement) reported statistically significant improvements in health outcomes when comparing experimental and control groups before and after the intervention. It is well recognised that interventions which increase workers' autonomy or decision latitude and lead to greater alignment between employee needs and the work environment are likely to increase job satisfaction (Baltes 1999), reduce stress and the likelihood of stress-related morbidity and ultimately lead to improvements in workers' health (Bosma 1997; Kuper 2003; Marmot 2006). Although the study on flexitime reported no significant effects in this review it should not be assumed that flexitime interventions have no health impacts as it is not possible to draw conclusions on the basis of one study alone, especially since the study considered only self-reported measures of physiological and psychological health and the follow-up period may not have been sufficient to discern any small changes in outcomes. In contrast, the effects of employer-orientated forms of flexibility, such as casual employment and labour hire, are likely to play out differently with the worker lacking job security, protection and choice and control (Benach 2007). Since we did not include studies of the informal labour market in our inclusion criteria it is not possible to comment further on how these effects might be observed.

Our findings correspond with those published in an earlier systematic review on changes in shift work (Bambra 2008a) which reported that self-scheduling of shifts was beneficial to health and work-life balance. Similarly, a systematic review of the compressed working week (CWW) (Bambra 2008b) found evidence to suggest that the CWW improved work-life balance in employees with little or no adverse health effects. These reviews also found few studies which differentiated their results by socio-economic status or demographic characteristics. Moreover, both reviews draw attention to the limitations of the existing evidence base and call for well-designed intervention studies to address these deficits.

An earlier meta-analysis of flexitime and the compressed working week (Baltes 1999) considered only organisational outcomes (productivity, performance, job satisfaction, satisfaction with work schedule) and absenteeism. In relation to absenteeism (which we define in our review as a secondary outcome due to the complexity of sickness absence as an outcome and the possible array of confounding factors thought to influence it, such as psychological/personality traits, family situation/childcare arrangements, work-home interference and cultures of presenteeism and local norms about the acceptability of sickness absence (see Moreau 2004)) the authors found that flexitime had a positive effect (mean weighted effect size 0.93, 95% CI 0.83 to 1.03). The meta-analysis also revealed that managers and professionals were less affected by flexitime than general employees. The authors suggest that flexitime schedules are unlikely to benefit those workers who already have high levels of control and choice (Baltes 1999). Due to the small number of studies retrieved in our review and the absence of outcome reporting by occupational grade we are unable to provide data to support or oppose these hypotheses.

AUTHORS' CONCLUSIONS

Implications for practice

The evidence in this review suggests that interventions which increase employee control by offering worker-orientated flexibility (specifically self-scheduling and partial/gradual retirement) are likely to be associated with health improvements including improvements in physical health (reduced systolic blood pressure and heart rate), mental health (e.g. reduced psychological stress) and general health (e.g. tiredness and sleep quality) measures. Importantly, interventions which increased worker flexibility were not associated with any adverse health effects in the short term. Kandolin 1996 reported significant reductions in tiredness during the night shift when comparing intervention and

control group participants, although it should be noted that this study reported on the effects of multiple interventions. Smith 1998 demonstrated improvements in mental health, sleep quality on day shift, sleep duration on night shift and alertness during night shift in the intervention group compared with the comparison group. Viitasalo 2008 found statistically significant decreases in systolic blood pressure and heart rate for workers with flexible scheduling compared with those in the control group. Pryce 2006 found no significant changes in primary health outcomes, although improvements in some secondary outcomes were noted when comparing intervention and control groups.

The evidence base evaluating the effectiveness of flexible working interventions in the form of well-designed controlled before and after studies is small and methodologically limited. If the benefits and harms of flexible working are to be fully understood, then prospective, well-controlled intervention studies of the health and wellbeing effects of flexible working are urgently required, particularly those that examine differences in health outcomes by socio-economic status, occupational grade or demographic characteristics. However, bearing in mind the limitations of the studies, it is fair to suggest that, given the absence of ill health effects associated with worker-defined flexibility and the evidence of some improvements in a subset of health and wellbeing outcomes, certain types of worker-orientated flexible arrangements (specifically self-scheduling and partial/gradual employment) represent a plausible means through which policymakers and employers can promote healthier workplaces and improve work practices.

Implications for research

Given the increasing importance accorded to the work environment as a determinant of health by policymakers and practitioners (Black 2008), it is disappointing that this review has highlighted a paucity of high quality intervention studies relating to the effects of flexible working on health and wellbeing. To date much of the research examining the effects of flexible working conditions on health has adopted a cross-sectional design, which does not enable exploration of causality. Future empirical studies should involve a prospective design with matched control groups, objective measures of health outcomes, and adequate follow-up periods to examine long-term health effects. In addition, given the small number of intervention studies on the health effects of flexitime (only one study on flexitime was retrieved that fulfilled our inclusion criteria) we call for studies to address this specific deficit. Further, it is important that future studies make explicit information regarding the background to and the motivation for the intervention as well as details on how the intervention was delivered and the extent to which workers and managers supported the arrangements. Echoing calls made elsewhere (Bambra 2009b; Mackenbach 2003; Tugwell 2004), we would urge future studies to undertake analyses by different subgroups to assess any possible effects on health inequalities.

This review has concentrated on examining the effects of flexible working interventions on health and wellbeing outcomes. Future reviews could extend this focus to consider the organisational or economic effects of these interventions by considering outcomes such as staff turn-over, worker performance, job satisfaction and employee morale. There is also a need to consider the cost-effectiveness of flexible working arrangements. Given the dearth of controlled before and after studies, there is a case for the next levels of evidence (including retrospective cohort studies and non-intervention studies which examine the impacts of flexible working using a comparative approach) to be interrogated. This would be particularly fruitful for the analysis of the health effects of spatial flexibility interventions, namely teleworking.

ACKNOWLEDGEMENTS

We wish to thank Elizabeth Blenkinsopp for assistance with the searches and Ruth Turley for checking the search strategy and for advice on the search process. We would also like to acknowledge Danielle Dixey who provided administrative assistance in terms of contacting authors, undertaking website searches and obtaining studies. We are grateful also to our review advisory group members: Professor Antony Lamontagne, Professor Martin White, Professor Carolyn Summerbell, Dr Else Nygaard and Dr Dheeraj Bansal for their insightful comments on the protocol and review. Finally, we appreciate the invaluable advice and support of the Public Health Review Group Editorial base in the preparation of this review.

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CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Calvo 2009

Methods	Controlled before and after study, 12-year follow up
Participants	USA, participants were from the Health and Retirement Study, a nationally representative biennial survey of older Americans and their spouses
Interventions	Partial retirement
Outcomes	Mental health: depression (Diener 1999; Frey 2002; Perreira 2005; Veenhoven 1991)
Type of flexibility	Unclear but likely to be requested/negotiated by the worker
Notes	—
Risk of bias	

Calvo 2009 *(Continued)*

Bias	Authors' judgement	Support for judgement
Representative sample	Low risk	
Appropriate control	Low risk	
Adequate follow-up response	High risk	
Adjustment for non-response	Low risk	
Conclusions substantiated	Low risk	
Adequate adjustment for confounders	Low risk	
Protection against contamination	Low risk	
Appropriate statistics	Low risk	

De Raeve 2007

Methods	Controlled before and after study, 12 and 24-month follow up
Participants	Various workplaces (45 companies), Netherlands. Blue and white collar workers, mostly male.
Interventions	Overtime
Outcomes	Mental health: psychological stress (GHQ-12, Goldberg 1991) General health: self-rated general health (one item from SF-36, Aaronson 1998); prolonged fatigue (Checklist Individual Strength Vercoulen 1994); need for recovery from work (11-items van Veldhoven 2003) General health: self-rated general health (one item from the SF-36 Aaronson 1998); prolonged fatigue (Checklist Individual Strength Vercoulen 1994) and need for recovery from work (20 items, van Veldhoven 2003)
Type of flexibility	Unclear as to whether overtime was dictated by the employer or requested by the employee
Notes	—

Risk of bias

Bias	Authors' judgement	Support for judgement
Representative sample	High risk	
Appropriate control	Low risk	
Adequate baseline response	High risk	

De Raeve 2007 *(Continued)*

Adequate follow-up response	High risk
Adjustment for non-response	High risk
Conclusions substantiated	Low risk
Adequate adjustment for confounders	Low risk
Protection against contamination	Low risk
Appropriate statistics	Low risk

de Vaus 2007

Methods	Controlled before and after study, 12, 24 and 36 months follow up
Participants	Australia, workers with various types of employment
Interventions	Gradual retirement defined as a retirement transition characterised by a progressive withdrawal from work or a withdrawal and then return part-time
Outcomes	Mental health: positive and negative affect (Lawton 1992, 10 items); self-image (comprising 4 items from the Rosenberg 1965 self-esteem scale, 3 items from the Adelmann 1994 self-efficacy scale and 4 items from Scheier 1985 optimism scale) General health: health status (unclear as to whether this was a validated tool) Secondary outcomes: life satisfaction (Campbell 1976); marital cohesion (Spanier 1976)
Type of flexibility	Unclear but likely to be worker-negotiated to enhance post-retirement life satisfaction
Notes	—

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Representative sample	Low risk	
Appropriate control	Low risk	
Adequate follow-up response	High risk	
Conclusions substantiated	Low risk	
Adequate adjustment for confounders	Low risk	
Protection against contamination	Low risk	

de Vaus 2007 *(Continued)*

Appropriate statistics	Low risk

Dooley 2000

Methods	Controlled before and after study, 24-month follow up
Participants	National Longitudinal Survey of Youth, USA
Interventions	Involuntary part-time employment (inadequate employment)
Outcomes	Mental health: psychological functioning (Center for Epidemiologic Studies Depression scale CES-D)
Type of flexibility	Employer/labour market dictated
Notes	Multiple intervention study, outcome data are reported for involuntary part-time workers pooled with workers on a poverty wage

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Representative sample	Low risk	
Appropriate control	Low risk	
Adequate follow-up response	Low risk	
Conclusions substantiated	Low risk	
Adequate adjustment for confounders	Low risk	
Appropriate statistics	Low risk	

Dunham 1987

Methods	Controlled before and after study, 3 and 6 months follow up
Participants	Corporate office of a Midwestern utility organisation, non-supervisory (professional, clerical and technical) and supervisory personnel
Interventions	Flextime/flexitime
Outcomes	Physical health: physiological stress (7-item, Patchen 1970) Mental health: psychological stress (7-item, Patchen 1970)
Type of flexibility	Worker negotiated
Notes	—

Dunham 1987 *(Continued)*

Risk of bias

Bias	Authors' judgement	Support for judgement
Appropriate control	Low risk	
Adequate follow-up response	Low risk	
Adjustment for non-response	Low risk	
Conclusions substantiated	Low risk	
Adequate adjustment for confounders	High risk	
Protection against contamination	Low risk	
Appropriate statistics	High risk	

Kandolin 1996

Methods	Controlled before and after study, 6-month follow up
Participants	Hospital, Finland, midwives
Interventions	Self-scheduling of hours
Outcomes	Mental health: mental stress, tiredness, mental strain (Standard Shiftwork Index, Barton 1992 and Occupational Stress Questionnaire, Elo 1992)
Type of flexibility	Worker-orientated, intervention designed to reduce worker fatigue
Notes	Multiple interventions implemented: self-scheduling alongside a change from slow to fast rotation and from backward to forward rotation

Risk of bias

Bias	Authors' judgement	Support for judgement
Representative sample	Low risk	
Appropriate control	High risk	
Adequate baseline response	Low risk	
Adequate follow-up response	High risk	
Adjustment for non-response	High risk	

Kandolin 1996 *(Continued)*

Conclusions substantiated	Low risk
Adequate adjustment for confounders	High risk
Protection against contamination	Low risk
Appropriate statistics	Low risk

Pryce 2006

Methods	Controlled before and after study, 20 months follow up
Participants	Psychiatric hospital, Denmark, 60% nurses, 40% healthcare workers
Interventions	Open rota self-scheduling
Outcomes	Mental health: stress symptoms, three 4-item scales: behavioural, cognitive and somatic symptoms (Setterlind 1995); vitality, 4 items (Setterlind 1995) General health: global self-rated health (Borg 2000) Secondary outcomes: Sense of community, 3-item scale from the Copenhagen Psychosocial Questionnaire (Kristensen 1998) Social support from the Copenhagen Psychosocial Questionnaire (Kristensen 1998) Unvalidated 5-item indices of work-life balance developed for this study (outcome data therefore not reported)
Type of flexibility	Worker-orientated, intervention was designed, implemented and evaluated using a participatory approach and aimed to benefit the health, wellbeing , job satisfaction and work-life balance of nursing staff
Notes	—

Risk of bias

Bias	Authors' judgement	Support for judgement
Representative sample	High risk	
Appropriate control	Low risk	
Adequate follow-up response	Low risk	
Adjustment for non-response	Low risk	
Conclusions substantiated	Low risk	
Adequate adjustment for confounders	High risk	

Pryce 2006 *(Continued)*

Protection against contamination	High risk
Appropriate statistics	Low risk

Rodriguez 2002

Methods	Controlled before and after study, 12 months follow up
Participants	Three years of data (1991 to 1993) from German, Sozio-Oekonomisches Panel (SOEP), and the UK, from the British Household Panel Study (BHPS)
Interventions	Fixed-term contract (no permanent contract)
Outcomes	General health: perceived health status on a 5-point scale (from excellent to very poor). A single 5-level self-rated health status item has been shown to be a good predictor of long-term survival (Benyamin 1999; Idler 1997)
Type of flexibility	Employer dictated
Notes	—

Risk of bias

Bias	Authors' judgement	Support for judgement
Representative sample	Low risk	
Appropriate control	Low risk	
Adjustment for non-response	Low risk	
Conclusions substantiated	Low risk	
Adequate adjustment for confounders	Low risk	
Protection against contamination	Low risk	
Appropriate statistics	Low risk	

Smith 1998

Methods	Controlled before and after study, 6 months follow up
Participants	Police service, UK, police officers
Interventions	Compressed working week with flexibility: 5 or 7 8-hour shifts with 2 or 3 days off to with flexible starts with 4 12-hour shifts, then 4 days off. Two control groups (i) rigid starts with 4 12-hour shifts, then 4 days off and (ii) 8-hour shift rota

Smith 1998 *(Continued)*

Outcomes	Physical health: physical health questionnaire (Barton 1995); sleep alertness, chronic fatigue, (Standard Shiftwork Index, Barton 1995) Mental health: psychological stress (GHQ-12, Goldberg 1972) Secondary outcomes: Work-life balance: interference with social and family life (Barton 1995, Standard Shiftwork Index)
Type of flexibility	Worker-orientated
Notes	—

Risk of bias

Bias	Authors' judgement	Support for judgement
Adequate follow-up response	High risk	
Adjustment for non-response	High risk	
Conclusions substantiated	Low risk	
Adequate adjustment for confounders	Low risk	
Protection against contamination	Low risk	
Appropriate statistics	Low risk	

Viitasalo 2008

Methods	Controlled before and after study, 7 to 8 months follow up
Participants	Airline company (line maintenance), Finland, maintenance workers
Interventions	Flexibility of a shift system which responded and attempted to reconcile employer's operational needs and employee's wishes and needs regarding shift changes, holidays, or days off. The workers were therefore allowed some individual flexibility and control over their work hours in exchange for variability.
Outcomes	Physical health: experimental measures, blood pressure, heart rate, total cholesterol, HDL, LDL, triglycerides, fasting plasma glucose, glycosylated haemoglobin, C- reactive protein General health: sleepiness and sleep disturbances; falling asleep at work (Epworth Sleepiness Scale, ESS scores, Johns 1991) Secondary outcomes: Health behaviours: physical activity (International Physical Activity Questionnaire) alcohol, caffeine, quality of fat and fibre intake
Type of flexibility	Mainly worker-orientated to take account of individual choice and control but some flexibility to address company needs

Viitasalo 2008 *(Continued)*

Notes	—

Risk of bias

Bias	Authors' judgement	Support for judgement
Representative sample	High risk	
Appropriate control	High risk	
Adequate baseline response	High risk	
Adequate follow-up response	Low risk	
Adjustment for non-response	Low risk	
Conclusions substantiated	Low risk	
Adequate adjustment for confounders	Low risk	
Protection against contamination	Low risk	
Appropriate statistics	Low risk	

ESS = Epworth Sleepiness Scale; HDL = high-density lipoprotein; LDL = low-density lipoprotein

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Abbott 1995	Excluded due to absence of health outcomes (job satisfaction only)
Adamson 1994	Excluded due to design, no before measures and no primary health outcomes
Akerstadt 1978	Excluded as primary health outcomes were not reported using a validated instrument
Akerstedt 1996	Excluded, not an intervention study, also outcomes reported retrospectively
Andrews 2005	Excluded due to design, no before and after measures and no health outcomes
Bardasi 2004	Excluded due to design, no control group or before measures
Barton 1993	Excluded, not an intervention study
Boggild 2001	Excluded, does not qualify as a flexible working intervention according to our inclusion criteria
Breaugh 2008	Excluded due to design, not an intervention study, cross-sectional data only
Brisson 1989	Excluded due to design, retrospective data only

Study	Reason for exclusion
Buddendick 1999	Excluded due to design, no control group
Casey 2008	Excluded due to design, not an intervention study
Choi 1986	Excluded, no primary health outcomes, considers retention, job satisfaction and organisational outcomes only
Dahlgren 2006	Excluded as follow-up period too short (2 weeks)
Davis 2008	Excluded due to design, not an intervention study
de Haan 1990	Excluded due to primary health outcomes not being measured using a validated instrument
Evans 1973	Time series design with comparison group but excluded as does not measure primary health outcomes (job and leisure satisfaction only)
Evans 1975	Excluded as no primary health outcomes (employee attitudes, job satisfaction, impact on work and leisure)
Finch 1997	Excluded due to design, not an intervention study
Gauderer 2004	Excluded due to no primary health outcomes (accidents only)
Gelfand 2004	Excluded due to design, no control
Gomez-Mejia 1978	Excluded, due to design cross-sectional data only
Gopal 2005	Excluded due to design, no control
Grzywacz 2007	Excluded as not a specific intervention study. The longitudinal element looked at change in perceived flexibility over a 12-month period. Also no primary health outcomes measured; health behaviours are defined as secondary outcomes in this review.
Grzywacz 2008	Excluded due to design, not an intervention study, cross-sectional data only
Harrick 1986	Excluded due to design, no control group
Hartig 2007	Excluded due to study design, cross-sectional data only
Hauburger 1997	Excluded due to study design, not a before and after study, descriptive focus on implementation of self-scheduling
Hicks 1981	Excluded due to design, no before measures, cross-sectional comparative design
Holdsworth 2003	Excluded due to design, not an intervention study, cross-sectional and qualitative data only
Hsueh 2007	Excluded, no primary health outcomes measured using a validated tool
Hutter 2006	Excluded due to design, prospective repeat cross-section
Imai 2004	Excluded due to intervention not fulfilling inclusion criteria, study examined job specific work system as opposed to region-specific work system and looked at aspects of support systems, relations with physicians and emergency support
Imbrechts 1995	Excluded as no empirical data (descriptive piece)

Study	Reason for exclusion
Jansen 2003	Excluded due to design, not an intervention study, no 'before' measures. Also did not examine flexibility specifically.
Janssen 2004	Excluded due to design, not an intervention study, cross-sectional data only
Kandolin 2001	Excluded due to design, not an intervention study
Kane 1999	Excluded due to design, not an intervention study, retrospective data
Kelloway 1998	Excluded due to design, not an intervention study
Konradt 1999	Excluded due to design, not an intervention study, prospective cohort which compares different amounts of telework
Lee 1983	Exclude due to design, no control group
Lowden 2000a	Excluded as primary health outcomes are not measured using a validated instrument
Lowden 2000b	Excluded as primary health outcomes are not measured using a validated instrument
Martens 1999	Excluded due to design, not an intervention study
Martimo 2008	Excluded, reports on planned research, RCT, no findings yet
Narayanan 1982a	Excluded due to design, follow up 3 months only
Narayanan 1982b	Excluded due to design, follow up 3 months only
Narayanan 1984	Excluded due to design, follow up 3 months only
Orpen 1981	Excluded due to no health outcomes (job satisfaction, performance and productivity outcomes only)
Parker 2002	Exclude as no health outcomes (participative decision-making, role overload, role conflict, job strain)
Patrick 2008	Exclude as not an intervention study (looked at changes in perceived flexibility).
Sullivan 2002	Excluded as no primary health outcomes reported (secondary outcomes only)
Vinet 1986	Excluded due to design, not an intervention study
Vinet 1989	Excluded due to design, not an intervention study
Virtanen 2005	Not an intervention study, no before measures, no control group, longitudinal study of temporary workers
Wortley 2003	Excluded due to design, prospective repeat cross-section
Zheng 2006	Excluded as follow up less than 6 months

Characteristics of ongoing studies *[ordered by study ID]*

Garde 2008-2011

Trial name or title	Garde (2008-2011)
Methods	Controlled before and after study (follow-up period unclear from study protocol)
Participants	Shiftworkers, Denmark
Interventions	Self-rostering
Outcomes	Subjective health complaints (Eriksen 1999) Sickness absence Restitution (Sluiter 2003) Work-life balance (instrument for data collection unclear from study protocol)
Starting date	2008
Contact information	A. H. Garde, The National Research Centre for the Working Environment, Lerso Parkallé 105, DK-2100 Copenhagen, Denmark. ahg@arbejdsmiljoforskning.dk
Notes	—

Nabe-Nielsen 2006-2010

Trial name or title	Nabe-Nielsen K and Garde AH (ongoing study 2006 to 2010). New working hours in the eldercare sector.
Methods	Controlled before and after study, 12-month follow up
Participants	Eldercare sector, care workers, Denmark
Interventions	Influence on own working hours/work-time control. Intervention involves individualised computer-based planning of the work schedule.
Outcomes	Sleep quality (1 item); disturbed sleep index (DSI, 5 items); Awakening Index (AWI, 3 items) from the Karolinska Sleep Diary (Akerstedt 1994) Experimental measures of biomarkers for cardiovascular disease: total cholesterol, HDL cholesterol apo-lipoprotein, A1, apo-lipoprotein B, glycated haemoglobin, testosterone
Starting date	2006
Contact information	K. Nabe Nielsen, The National Research Centre for the Working Environment, Lerso Parkallé 105, DK-2100 Copenhagen, Denmark. knn@nrcwe.dk
Notes	—

APPENDICES

Appendix 1. Electronic database searches (in alphabetical order)

ABI Inform (1971 -) (Proquest)

Searched 21 May 2009

128 records retrieved

Search 1

((physical health or mental health or health or wellbeing or sickness absence* or work life balance or quality of life or illness or stress)) AND ((flex* work* or work schedule tolerance or job-shar* or self schedul* or shiftwork* or telework* or home work* or overtime or flex* contract*)) AND ((follow-up or longitudinal or prospective* or cohort or evaluation))

(43 records retrieved)

Search 2

((physical health or mental health or health or wellbeing or sickness absence* or work life balance or quality of life or illness or stress)) AND ((flex* time* or workplace flexibility or piecework* or marginal employ* or contingent employ* or atypical employ* or irregular work* hours)) AND ((follow-up or longitudinal or prospective* or cohort or evaluation))

(10 records retrieved)

Search 3

((physical health or mental health or health or wellbeing or sickness absence* or work life balance or quality of life or illness or stress)) AND ((compress* work* hours or compress* work* week or annuali?ed hours or stagger* hours or zero hours or work life polic*)) AND ((follow-up or longitudinal or prospective* or cohort or evaluation))

(75 records retrieved)

ASSIA (1987 -) (CSA Illumina)

Searched 16 June 2009

715 records retrieved

((DE=(health or wellbeing or well-being) or DE=morbidity) or(KW=((back pain) or Backpain or lbp) or KW=((low back pain) or lumbago or (cardiovascular diseases)) or KW=((heart diseases) or hypertension or (mental health))) or(KW=((psychological outcome*) or Anxiety or (Professional burnout)) or KW=((Psychological stress) or depression or ("quality of life")) or KW=((job satisfaction) or Empower* or (decision latitude))) or(KW=((work life balance) or (work-life balance) or (work family conflict*)) or KW=(musculoskeletal within 2 disorder*)) or(KW=(musculo within 2 skeletal within 2 disorder*)) or(KW=((promot* or manag* or facilitat* or enable*1 or enabling or barrier*1 or increas* or obstruct* or encourag* or prevent* or time or free or disrupt* or relationship* or conflict) within 2 (health or healthy or healthier))) or(KW=(mental health or physical health or health risk* or general health)) or(KW=((employee* or staff) within 2 (health))) or(KW=((health of worker*) or illness or ill) or KW=((sick* absence*) or (sick* leave))) or(KW=((days off) or (quality of life) or (general health questionnaire)) or KW=((mcGill pain questionnaire) or (blood pressure) or (obesity or obese or overweight)) or KW=((functional limitations profile) or (short form 36 or SF-36) or (euroqol or EQ-5d))) or(KW=((facilitat* or enable*1 or enabling or barrier*1 or obstruct* or encourag* or prevent* or time or free or disrupt* or relationship* or conflict) within 3 (household work or house work or chores or hobbies or hobby or friends or family))) or(KW=(social activit* or social network* or social life or free-time or free time)) or(KW=cholesterol) or(KW=(stress or burnout or depression or depressed))) and(((KW=((flexible work*) or shiftwork* or (shift work*)) or DE=((flexible work*) or shiftwork* or (shift work*))) or(KW=((non standard work*) or (non-standard work*) or (flexible time)) or DE=((non standard work*) or (non-standard work*) or (flexible time))) or(KW=((flexible workplace) or (flexible work* condition*)) or DE=((flexible workplace) or (flexible work* conditions) or (flexible time))) or(KW=((flexible work* time*) or (flexi time*) or flexitime*) or KW=((flex time*) or flextime* or flexi-time*) or KW=((flexible work* arrangement*) or (flexible work* hour*) or (work schedule tolerance))) or(KW=(("self schedule*") or self-schedule* or (unusual hour*)) or KW=((study leave) or (part-time work*) or (part time work*)) or KW=(weekend work*)) or(KW=(job* share*)) or(KW=((compress* work* hour*) or job-shar* or (stagger* hour*)) or KW=((annual* hour*) or (annualised hour*) or (annualized hour*)) or KW=((compress* work* week*) or overtime or (shift work*))) or(KW=(shiftwork* or (night work*) or nightwork*) or KW=((parental leave) or (long term leave) or sabbatical) or KW=(secondment or (home work*) or homework*)) or(KW=((work* from home) or telework* or (irregular work* hours)) or KW=((irregular work*) or (phase within 2 retire*) or (retirement scheme*)) or KW=((pension scheme*) or (early retirement) or (maternity leave))) or(KW=((non standard* employ* contract*) or (non-standard* employ* contract*) or (freelance* work*)) or KW=(free-lance* or (freelance* work*) or freelance*)) or(KW=((workplace flexibility) or (work place flexibility) or (flexible contract*)) or KW=((flexible salary form*) or (working time directive*) or (zero hours)) or KW=(daywork* or (day work*) or piecework*)) or(KW=((piece work*) or (adjust* hours) or (core hours)) or KW=((stagger* hours) or (time in lieu) or (time bank*)) or KW=((flexi break*) or flexibreak*))

or(KW=((reduc* hours) or (job split*) or (on call)) or KW=(oncall or (as needed hour*) or (casual hour*)) or KW=((weekday* swap*) or (week* day* swap*) or (weekday* swap*))) or(KW=((shift self select*) or (shift self-select*) or (week* on week* off)) or KW=((term time work*) or (term-time work*) or (buyable leave)) or KW=((flexi week*) or (flexi year*) or (performance related pay))) or(KW=((performance-related pay) or (adoption leave) or (adoption leave scheme*)) or KW=((flexi* lunch hour*) or (paternity scheme*) or (parental leave scheme*)) or KW=((dependent* leave) or (dependent* leave scheme*) or (special leave))) or(KW=((fixed term contract*) or (fixed-term contract*) or (temp* employ* or temp* contract*))) or(KW=((marginal employ*) or (contingent employ*) or (atypical employ*)) or KW=((carer* leave) or (unpaid leave) or (precarious work*)) or KW=((work life polic*) or (occasional flexibil*))) or(KW=(work within 2 life within 2 polic*)) or(KW=((reduc* within 2 hours) or (job*1 sharing))) or(KW=((compress* within 2 hours) or (annualized within 2 hours) or (annualised within 2 hours))) or(KW=((day or night or late or early or evening or core or stagger* or compress* or irregular) within 2 (work* or shift*1 or hours*))) or(KW=(sabbatical* or secondment* or (career* within 3 break*)) or KW=((home working) or (work* within 2 home))) or(KW=((maternal leave) or (paternal leave) or (adapt* hours)) or KW=(time banking)) or(KW=((work life or worklife) within 2 (balance*))) or(KW=(flexible within 2 contract*))) and((KW=(work or workplace or employment)) or(KW=((company or companies) within 5 (work* or employ* or job* or staff or personnel or business*))) or(KW=(factory or factories or human resource* or Business*)) or(KW=("Small and medium enterprises" or SMEs)) or(KW=(worker* or workplace* or worksite* or staff or personnel)) or(KW=(employee* or employer*)) or(KW=(work within 3 office*)) or(KW=(work place* or work site* or work location* or work setting*)) or(KW=((job* or employment) within 2 (place* or site* or location* or setting*)))))

CINAHL (1981 -) (Ebsco)

Searched 13 May 2009

918 records retrieved

1 exp MORBIDITY/

2 Morbidity.ti,ab

3 exp BACK PAIN/

4 BackPain.ti,ab

5 LOW BACK PAIN/

6 lbp.ti,ab

7 lumbago.ti,ab

8 exp CARDIOVASCULAR DISEASES/ OR exp CARDIOVASCULAR ABNORMALITIES/

9 exp HEART DISEASES/

10 exp HYPERTENSION/

11 MENTAL HEALTH/

12 "psychological outcome$".ti,ab

13 exp ANXIETY/

14 BURNOUT, PROFESSIONAL/

15 exp STRESS, PSYCHOLOGICAL/

16 Wellbeing.ti,ab

17 PSYCHOLOGICAL WELL-BEING/

18 (Well AND being).ti,ab

19 exp DEPRESSION/

20 well-being.ti,ab

21 QUALITY OF LIFE/

22 exp JOB SATISFACTION/

23 EMPOWERMENT/

24 "decision latitude".ti,ab

25 "work life balance".ti,ab

26 "work-life balance".ti,ab

27 "work family conflict$".ti,ab

28 ((musculoskeletal adj2 disorder$)).ti,ab

29 ((musculo adj2 skeletal adj2 disorder$)).ti,ab

30 exp HEALTH/

31 (promot$ OR manag$ OR facilitat$ OR enable$1 OR enabling OR barrier$1 OR increas$ OR obstruct$ OR encourag$ OR prevent$ OR time OR free OR disrupt$ OR relationship$ OR conflict).ti,ab

32 (health OR healthy OR healthier).ti,ab

33 (31 adj2 32).ti,ab

34 ((mental health OR physical health OR health risk$ OR general health)).ti,ab

35 ((employee$ OR staff)).ti,ab

36 health.ti,ab

37 (35 adj2 36).ti,ab

38 "Health of worker$".ti,ab

39 Illness.ti,ab

40 Ill.ti,ab

41 (sick$ AND absence$).ti,ab

42 SICK LEAVE/

43 ((GP OR hospital OR doctor OR gps)).ti,ab

44 ((consultation$1 OR appointment$1)).ti,ab

45 (43 adj2 44).ti,ab

46 (days AND off).ti,ab

47 exp QUALITY OF LIFE/

48 (general AND health AND questionnaire).ti,ab

49 MCGILL PAIN QUESTIONNAIRE/

50 exp BLOOD PRESSURE/

51 exp HYPERTENSION/

52 ((obesity OR obese OR overweight)).ti,ab

53 exp BACK PAIN/

54 (functional AND limitations AND profile).ti,ab

55 "SHORT FORM-36 HEALTH SURVEY (SF-36)"/

56 ((euroqol OR EQ-5d)).ti,ab

57 ((facilitat$ OR enable$1 OR enabling OR barrier$1 OR obstruct$ OR encourag$ OR prevent$ OR time OR free OR disrupt$ OR relationship$ OR conflict)).ti,ab

58 ((household work OR house work OR chores OR hobbies OR hobby OR friends OR family)).ti,ab

59 (57 adj3 58).ti,ab

60 ((social activit$ OR social network$ OR social life OR free-time OR free time)).ti,ab

61 exp CHOLESTEROL/

62 ((facilitat$ OR enable$1 OR enabling OR barrier$1 OR obstruct$ OR encourag$ OR prevent$ OR time OR free OR disrupt$ OR relationship$ OR conflict)).ti,ab

63 ((cooking OR cleaning)).ti,ab

64 (62 adj2 63).ti,ab

65 ((stress OR burnout OR depression OR depressed)).ti,ab

66 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14 OR 15 OR 16 OR 17 OR 18 OR 19 OR 20 OR 21 OR 22 OR 23 OR 24 OR 25 OR 26 OR 27 OR 28 OR 29 OR 30 OR 33 OR 34 OR 37 OR 38 OR 39 OR 40 OR 41 OR 42 OR 45 OR 46 OR 47 OR 48 OR 49 OR 50 OR 51 OR 52 OR 53 OR 54 OR 55 OR 56 OR 59 OR 60 OR 61 OR 64 OR 65

67 (flexible AND work$).ti,ab

68 "flexible workplace".ti,ab

69 "flexible work$ condition$".ti,ab

70 "flexible work$ time$".ti,ab

71 "flexi time$".ti,ab

72 flexitime$.ti,ab

73 "flex time$".ti,ab

74 flextime$.ti,ab

75 flexi-time$.ti,ab

76 "flexible work$ arrangement$".ti,ab

77 "flexible work$ hour$".ti,ab

78 "Work Schedule Tolerance".ti,ab

79 "self schedul$".ti,ab

80 self-schedule$.ti,ab

81 "unusual hour$".ti,ab

82 PART TIME EMPLOYMENT/

83 "part-time work$".ti,ab

84 "part time work$".ti,ab

85 "weekend work$".ti,ab

86 "Job$1 share$".ti,ab

87 "compress$ work$ hour$".ti,ab

88 "job-shar$".ti,ab

89 "stagger$ hour$".ti,ab

90 "annual$ hour$".ti,ab

91 "annualised hour$".ti,ab

92 "compress$ work$ week$".ti,ab

93 overtime.ti,ab

94 shiftwork$.ti,ab

95 "shift work$".ti,ab

96 "night work$".ti,ab

97 nightwork$.ti,ab

98 PARENTAL LEAVE/

99 "long term leave".ti,ab

100 SABBATICALS/

101 secondment.ti,ab

102 "home work$".ti,ab

103 homework$.ti,ab

104 "work$ from home".ti,ab

105 TELECOMMUTING/

106 telework$.ti,ab

107 "irregular work$ hours".ti,ab

108 "irregular work$".ti,ab

109 ((phase$ adj2 retire$)).ti,ab

110 "retirement scheme$".ti,ab

111 "pension scheme$".ti,ab

112 "early retirement".ti,ab

113 PARENTAL LEAVE/

114 "maternity leave".ti,ab

115 "paternity leave".ti,ab

116 "non standard$ employ$ contract$".ti,ab

117 "non-standard employ$ contract$".ti,ab

118 "freelance$ work$".ti,ab

119 "free-lance$ work$".ti,ab

120 free-lance$.ti,ab

121 freelance$.ti,ab

122 "professional$ help$ with childcare".ti,ab

123 "professional$ help$ with housework".ti,ab

124 "professional$ help$ with household work$".ti,ab

125 "workplace flexibility".ti,ab

126 "work place flexibility".ti,ab

127 "flexible contract$".ti,ab

128 "flexible salary form$".ti,ab

129 "working time directive$".ti,ab

130 "zero hours".ti,ab

131 daywork$.ti,ab

132 "day work$".ti,ab

133 piecework$.ti,ab

134 "piece work$".ti,ab

135 "adjust$ hours".ti,ab

136 "core hours".ti,ab

137 "stagger$ hours".ti,ab

138 "time in lieu".ti,ab

139 "time bank$".ti,ab

140 "flexi break$".ti,ab

141 flexibreak$.ti,ab

142 ((reduc$ ADJ hours)).ti,ab

143 "job split$".ti,ab

144 "on call".ti,ab

145 oncall.ti,ab

146 "as needed hour$".ti,ab

147 "casual hour$".ti,ab

148 "weekday$ swap$".ti,ab

149 "week day$ swap$".ti,ab

150 "weekend swap$".ti,ab

151 "shift self select$".ti,ab

152 "shift self-select$".ti,ab

153 "week$ on week$ off".ti,ab

154 "term time work$".ti,ab

155 "term-time work$".ti,ab

156 "buyable leave".ti,ab

157 "flexi week$".ti,ab

158 "flexi year$".ti,ab

159 "performance related pay".ti,ab

160 "performance-related pay".ti,ab

161 "adoption leave".ti,ab

162 "adoption leave scheme$".ti,ab

163 "flexi$ lunch hour$".ti,ab

164 "paternity scheme$".ti,ab

165 "parental leave scheme$".ti,ab

166 "dependent$ leave".ti,ab

167 "dependent$ leave scheme$".ti,ab

168 "special leave".ti,ab

169 "fixed term contract".ti,ab

170 "fixed-term contract$".ti,ab

171 ((temp$ employ$ OR temp$ contract$)).ti,ab

172 "marginal employ$".ti,ab

173 "contingent employ$".ti,ab

174 "atypical employ$".ti,ab

175 "carer$ leave".ti,ab

176 "unpaid leave".ti,ab

177 "precarious work".ti,ab

178 "work life polic$".ti,ab

179 "occasional flexibil$".ti,ab

180 ((work adj2 life adj2 polic$)).ti,ab

181 ((occasional adj2 flexibil$)).ti,ab

182 ((reduc$ ADJ 2hours)).ti,ab

183 "job$1 sharing".ti,ab

184 ((Compress$ adj2 hours)).ti,ab

185 ((Stagger$ adj2 hours)).ti,ab

186 ((Annuali?ed adj2 hours)).ti,ab

187 ((compress$ adj2 week)).ti,ab

188 ((day OR night OR late OR early OR evening OR core OR stagger$ OR compress$ OR irregular)).ti,ab

189 ((work$ OR shift$1 OR hours$)).ti,ab

190 (188 adj2 189).ti,ab

191 SABBATICALS/

192 secondment.ti,ab

193 ((career$ adj3 break$)).ti,ab

194 "home working".ti,ab

195 ((work$ adj2 home)).ti,ab

196 "maternal leave".ti,ab

197 "Maternity leave".ti,ab

198 "paternal leave".ti,ab

199 "paternity leave".ti,ab

200 (((work life OR worklife) adj2 balance$)).ti,ab

201 ((work life OR worklife)).ti,ab

202 Balance.ti,ab

203 (201 adj2 202).ti,ab

204 "adapt$ hours".ti,ab

205 "time banking".ti,ab

206 "work hour$1 restriction$".ti,ab

207 67 or 68 or 69 or 70 or 71 or 72 or 73 or 74 or 75 or 76 or 77 or 78 or 79 or 80 or 81 or 82 or 83 or 84 or 85 or 86 or 87 or 88 or 89 or 90 or 91 or 92 or 93 or 94 or 95 or 96 or 97 or 98 or 99 or 100 or 101 or 102 or 103 or 104 or 105 or 106 or 107 or 108 or 109 or 110 or 111 or 112 or 113 or 114 or 115 or 116 or 117 or 118 or 119 or 120 or 121 or 122 or 123 or 124 or 125 or 126 or 127 or 128 or 129 or 130 or 131 or 132 or 133 or 134 or 135 or 136 or 137 or 138 or 139 or 140 or 141 or 142 or 143 or 144 or 145 or 146 or 147 or 148 or 149 or 150 or 151 or 152 or 153 or 154 or 155 or 156 or 157 or 158 or 159 or 160 or 161 or 162 or 163 or 164 or 165 or 166 or 167 or 168 or 169 or 170 or 171 or 172 or 173 or 174 or 175 or 176 or 177 or 178 or 179 or 180 or 181 or 182 or 183 or 184 or 185 or 186 or 187

208 work.ti,ab

209 workplace.ti,ab

210 employment.ti,ab

211 (company OR companies).ti,ab

212 (work$ OR employ$ OR job$ OR staff OR personnel OR business$).ti,ab

213 (211 adj5 212).ti,ab

214 211 and 212

215 (factory OR factories OR human AND resource$ OR Business$).ti,ab

216 (("Small and medium enterprises" OR SMEs)).ti,ab

217 ((worker$ OR workplace$ OR worksite$ OR staff OR personnel)).ti,ab

218 ((employee$ OR employer$)).ti,ab

219 ((work$ adj3 office$)).ti,ab

220 ((work place$ OR work site$ OR work location$ OR work setting$)).ti,ab

221 ((job$ OR employment)).ti,ab

222 ((place$ OR site$ OR location$ OR setting$)).ti,ab

223 (221 adj2 222).ti,ab

224 208 or 209 or 210 or 213 or 214 or 215 or 216 or 217 or 218 or 219 or 220 or 223

225 224 and 207 and 66

COCHRANE (1988 -) (Wiley)

Searched 1 July 2009

99 records retrieved

#1 MeSH descriptor Mortality explode all trees

#2 (facilitat* or enable* or enabling or barrier* or obstruct* or encourag* or prevent* or time or free or disrupt* or relationship* or conflict) adj2 (cooking or cleaning)

#3 cholesterol

#4 ("social activit*" or "social network" or "social life" or free-time or "free time")

#5 (facilitat* or enable* or enabling or barrier* or obstruct* or encourag* or prevent* or time or free or disrupt* or relationship* or conflict) adj3 ("household work" or "house work" or chores or hobbies or hobby or friends or family)

#6 ("short form 36" or SF-36)

#7 "back pain"

#8 (euroqol or EQ-5d)

#9 (obesity or obese or overweight)

#10 "functional limitations profile"

#11 hypertension

#12 "blood pressure"

#13 "mcGill pain questionnaire"

#14 "general health questionnaire"

#15 "quality of life"

#16 "days off"

#17 (GP or hospital or doctor or gp) adj2 (consultation* or appointment*)

#18 (GP or hospital or doctor or gps) adj2 (consultation$1 or appointment$1)

#19 "sick* leave"

#20 "sick* absence*"

#21 ill

#22 illness

#23 "health of worker*"

#24 (employee* or staff) adj2 health

#25 "mental health" or "physical health" or "health risk*" or "general health"

#26 (promot* or manag* or facilitat* or enable* or enabling or barrier* or increas* or obstruct* or encourag* or prevent* or time or free or disrupt* or relationship* or conflict) adj2 (health or healthy or healthier)

#27 MeSH descriptor Health explode all trees

#28 "musculo adj2 skeletal adj2 disorder*"

#29 "musculoskeletal adj2 disorder*"

#30 "work family conflict*"

#31 "work-life balance"

#32 "work life balance"

#33 "decision latitude"

#34 empower*

#35 MeSH descriptor Job Satisfaction explode all trees

#36 MeSH descriptor Quality of Life explode all trees

#37 "well-being"

#38 MeSH descriptor Depression explode all trees

#39 wellbeing

#40 MeSH descriptor Stress, Psychological explode all trees

#41 MeSH descriptor Burnout, Professional explode all trees

#42 MeSH descriptor Anxiety explode all trees

#43 "psychological outcome*"

#44 MeSH descriptor Mental Health explode all trees

#45 MeSH descriptor Hypertension explode all trees

#46 MeSH descriptor Heart Diseases explode all trees

#47 MeSH descriptor Cardiovascular Diseases explode all trees

#48l umbago

#49 MeSH descriptor Low Back Pain explode all trees

#50 lbp

#51 backpain

#52 MeSH descriptor Back Pain explode all trees

#53 MeSH descriptor Mortality explode all trees

#54 (#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35 OR #36 OR #37 OR #38 OR #39 OR #40 OR #41 OR #42 OR #43 OR #44 OR #45 OR #46 OR #47 OR #48 OR #49 OR #50 OR #51 OR #52 OR #53)

#55 mortality

#56 (#54 OR #55)

#57 "flexible work"

#58 "flexible workplace"

#59 "flexible work* condition*"

#60 "flexible work* time*"

#61 "flexi time*"

#62 flexitime*

#63 "flex time*"

#64 flextime*

#65 flexi-time*

#66 "flexible work* arrangement*"

#67 "flexible work* hour*"

#68 MeSH descriptor Work Schedule Tolerance explode all trees

#69 "self schedul*"

#70 self-schedule*

#71 "unusual hour*"

#72 "part-time work*"

#73 "part time work*"

#74 "weekend work*"

#75 "Job* share*"

#76 "compress* work* hour*"

#77 "job-shar*"

#78 "stagger* hour*"

#79 "annual* hour*"

#80 "annualised hour*"

#81 "annualized hour*"

#82 "compress* work* week*"

#83 overtime

#84 shiftwork*

#85 "shift work*"

#86 "night work*"

#87 nightwork*

#88 MeSH descriptor Parental Leave explode all trees

#89 "long term leave"

#90 sabbatical

#91 secondment

#92 "home work*"

#93 homework*

#94 "work* from home"

#95 telework*

#96 "irregular work* hours"

#97 "irregular work*"

#98 ("phase* adj2 retire*")

#99 "retirement scheme*"

#100 "pension scheme*"

#101 "early retirement"

#102 "maternity leave"

#103 "paternity leave"

#104 "non standard* employ* contract*"

#105 "non-standard employ* contract*"

#106 "freelance* work*"

#107 "free-lance* work*"

#108 free-lance*

#109 freelance*

#110 "professional* help* with childcare"

#111 "professional* help* with housework"

#112 "professional* help* with household work*"

#113 "workplace flexibility"

#114 "work place flexibility"

#115 "flexible contract*"

#116 "flexible salary form*"

#117 "working time directive*"

#118 "zero hours"

#119 daywork*

#120 "day work*"

#121 piecework*

#122 "piece work*"

#123 "adjust* hours"

#124 "core hours"

#125 "stagger* hours"

#126 "time in lieu"

#127 "time bank*"

#128 "flexi break*"

#129 flexibreak*

#130 ("reduc* adj hours")

#131 "job split*"

#132 "on call"

#133 oncall

#134 "as needed hour*"

#135 "casual hour*"

#136 "weekday* swap*"

#137 "week day* swap*"

#138 "weekend swap*"

#139 "shift self select*"

#140 "shift self-select*"

#141 "week* on week* off"

#142 "term time work*"

#143 "term-time work*"

#144 "buyable leave"

#145 "flexi week*"

#146 "flexi year*"

#147 "performance related pay"

#148 "performance-related pay"

#149 "adoption leave"

#150 "adoption leave scheme*"

#151 "flexi* lunch hour*"

#152 "paternity scheme*"

#153 "parental leave scheme*"

#154 "dependent* leave"

#155 "dependent* leave scheme*"

#156 "special leave"

#157 "fixed term contract*"

#158 "fixed-term contract*"

#159 ("temp* employ*" or "temp* contract*")

#160 "marginal employ*"

#161 "contingent employ*"

#162 "atypical employ*"

#163 "carer* leave"

#164 "unpaid leave"

#165 "precarious work*"

#166 "work life polic*"

#167 "occasional flexibil*"

#168 ("work adj2 life adj2 polic*")

#169 ("reduc* adj2 hours")

#170 "job* sharing"

#171 ("Compress* adj2 hours")

#172 ("Stagger* adj2 hours")

#173 ("Annuali?ed adj2 hours")

#174 ("compress adj2 week")

#175 (day or night or late or early or evening or core or stagger* or compress* or irregular) adj2 (work* or shift* or hours*)

#176 Sabbatical*

#177 Secondment*

#178 ("career* adj3 break*")

#179 "home working"

#180 ("work* adj2 home")

#181 "maternal leave"

#182 "paternal leave"

#183 (work life or worklife) adj2 balance

#184 ("flexible adj2 contract*")

#185 "adapt* hours"

#186 "time banking"

#187 "work hour* restriction*"

#188 "flexible work* condition"

#189 (#57 OR #58 OR #59 OR #60 OR #61 OR #62 OR #63 OR #64 OR #65 OR #66 OR #67 OR #68 OR #69 OR #70 OR #71 OR #72 OR #73 OR #74 OR #75 OR #76 OR #77 OR #78 OR #79 OR #80 OR #81 OR #82 OR #83 OR #84 OR #85 OR #86 OR #87 OR #88 OR #89 OR #90 OR #91 OR #92 OR #93 OR #94 OR #95 OR #96 OR #97 OR #98 OR #99 OR #100 OR #101 OR #102 OR #103 OR #104 OR #105 OR #106 OR #107 OR #108 OR #109 OR #110 OR #111 OR #112 OR #113 OR #114 OR #115 OR #116 OR #117 OR #118 OR #119 OR #120 OR #121 OR #122 OR #123 OR #124 OR #125 OR #126 OR #127 OR #128 OR #129 OR #130 OR #131 OR #132 OR #133 OR #134 OR #135 OR #136 OR #137 OR #138 OR #139 OR #140 OR

#141 OR #142 OR #143 OR #144 OR #145 OR #146 OR #147 OR #148 OR #149 OR #150 OR #151 OR #152 OR #153 OR #154 OR #155 OR #156 OR #157 OR #158 OR #159 OR #160 OR #161 OR #162 OR #163 OR #164 OR #165 OR #166 OR #167 OR #168 OR #169 OR #170 OR #171 OR #172 OR #173 OR #174 OR #175 OR #176 OR #177 OR #178 OR #179 OR #180 OR #181 OR #182 OR #183 OR #184 OR #185 OR #186 OR #187 OR #188)

#190 work or workplace or employment

#191 (company or companies) adj5 (work* or employ* or job* or staff or personnel or business*)

#192 (factory or factories or "human resource*" or Business*)

#193 "Small and medium enterprises" or SMEs

#194 (worker* or workplace* or worksite* or staff or personnel)

#195 (employee* or employer*)

#196 ("work* adj3 office*")

#197 "work place*" or "work site*" or "work location*" or "work setting*"

#198 (job* or employment) adj2 (place* or site* or location* or setting*)

#199 (#190 OR #191 OR #192 OR #193 OR #194 OR #195 OR #196 OR #197 OR #198)

#200 (#54 AND #189)

#201 (#200 AND #199)

#202 (#200 AND #199)

#203 MeSH descriptor Work explode all trees

#204 MeSH descriptor Employment explode all trees

#205 MeSH descriptor Occupational Health explode all trees

#206 (#203 OR #204 OR #205)

#207 (#189 AND #206)

Cochrane Public Health Group Specialised Register of Studies (register is in development)

Searched June 2009

18 studies identified as potentially relevant.

Flexi or Work or Shift or Hour or Schedule or Job or Time or Sabbatical or Secondment or Scheme or Leave or Freelance or Pay or Contract or Compress

EMBASE (1980 to 2009 Week 17) (Ovid)

Searched 1 May 2009

2382 records retrieved

1 exp Morbidity/ or morbidity.ti,ab.

2 exp Back Pain/

3 backpain.mp.

4 lbp.mp.

5 exp Low Back Pain/

6 lumbago.mp.

7 exp Cardiovascular Diseases/

8 exp Heart Diseases/

9 exp Hypertension/

10 exp Mental Health/

11 psychological outcome$.mp.

12 exp Anxiety/

13 exp Burnout, Professional/

14 exp Stress, Psychological/

15 wellbeing.mp.

16 exp Depression/

17 well-being.mp.

18 exp "Quality of Life"/

19 exp Job Satisfaction/

20 empower$.mp.

21 decision latitude.mp.

22 work life balance.mp.

23 work-life balance.mp.

24 work family conflict$.mp.

25 (musculoskeletal adj2 disorder$).mp.

26 (musculo adj2 skeletal adj2 disorder$).mp.

27 exp health/

28 ((promot$ or manag$ or facilitat$ or enable$1 or enabling or barrier$1 or increas$ or obstruct$ or encourag$ or prevent$ or time or free or disrupt$ or relationship$ or conflict) adj2 (health or healthy or healthier)).ti,ab.

29 (mental health or physical health or health risk$ or general health).ti,ab.

30 ((employee$ or staff) adj2 health).ti,ab.

31 health of worker$.ti,ab.

32 illness.ti,ab.

33 ill.ti,ab.

34 sick$ absence$.ti,ab.

35 sick$ leave.ti,ab.

36 ((GP or hospital or doctor or gps) adj2 (consultation$1 or appointment$1)).ti,ab.

37 days off.ti,ab.

38 quality of life.ti,ab.

39 general health questionnaire.ti,ab.

40 mcGill pain questionnaire.ti,ab.

41 blood pressure.ti,ab.

42 hypertension.ti,ab.

43 (obesity or obese or overweight).ti,ab.

44 back pain.ti,ab.

45 functional limitations profile.ti,ab.

46 (short form 36 or SF-36).ti,ab.

47 (euroqol or EQ-5d).ti,ab.

48 ((facilitat$ or enable$1 or enabling or barrier$1 or obstruct$ or encourag$ or prevent$ or time or free or disrupt$ or relationship$ or conflict) adj3 (household work or house work or chores or hobbies or hobby or friends or family)).ti,ab.

49 (social activit$ or social network$ or social life or free-time or free time).ti,ab.

50 cholesterol.ti,ab.

51 ((facilitat$ or enable$1 or enabling or barrier$1 or obstruct$ or encourag$ or prevent$ or time or free or disrupt$ or relationship$ or conflict) adj2 (cooking or cleaning)).ti,ab.

52 (stress or burnout or depression or depressed).ti,ab.

53 or/1-52

54 flexible work$.ti,ab.

55 flexible workplace.ti,ab.

56 flexible work$ condition$.ti,ab.

57 flexible work$ time$.ti,ab.

58 flexi time$.ti,ab.

59 flexitime$.ti,ab.

60 flex time$.ti,ab.

61 flextime$.ti,ab.

62 flexi-time$.ti,ab.

63 flexible work$ arrangement$.mp.

64 flexible work$ hour$.mp.

65 exp Work Schedule Tolerance/

66 "self schedul$".ti,ab.

67 self-schedule$.ti,ab.

68 unusual hour$.ti,ab.

69 part-time work$.ti,ab.

70 part time work$.ti,ab.

71 weekend work$.ti,ab.

72 Job$1 share$.ti,ab.

73 compress$ work$ hour$.ti,ab.

74 job-shar$.ti,ab.

75 stagger$ hour$.ti,ab.

76 annual$ hour$.ti,ab.

77 annualised hour$.mp.

78 annualized hour$.mp.

79 compress$ work$ week$.mp.

80 overtime.mp.

81 shiftwork$.mp.

82 shift work$.mp.

83 night work$.mp.

84 nightwork$.mp.

85 exp Parental Leave/

86 long term leave.mp.

87 sabbatical.mp.

88 secondment.mp.

89 home work$.ti,ab.

90 homework$.ti,ab.

91 work$ from home.mp.

92 telework$.mp.

93 irregular work$ hours.mp.

94 irregular work$.mp.

95 (phase$ adj2 retire$).ti,ab.

96 retirement scheme$.mp.

97 pension scheme$.mp.

98 early retirement.mp.

99 maternity leave.mp.

100 paternity leave.mp.

101 non standard$ employ$ contract$.ti,ab.

102 non-standard employ$ contract$.ti,ab.

103 freelance$ work$.mp.

104 free-lance$ work$.mp.

105 free-lance$.mp.

106 freelance$.mp.

107 professional$ help$ with childcare.mp.

108 professional$ help$ with housework.mp.

109 professional$ help$ with household work$.mp.

110 workplace flexibility.mp.

111 work place flexibility.mp.

112 flexible contract$.mp.

113 flexible salary form$.mp.

114 working time directive$.mp.

115 zero hours.mp.

116 daywork$.mp.

117 day work$.mp.

118 piecework$.mp.

119 piece work$.mp.

120 adjust$ hours.mp.

121 core hours.mp.

122 stagger$ hours.mp.

123 time in lieu.mp.

124 time bank$.mp.

125 flexi break$.mp.

126 flexibreak$.mp.

127 (reduc$ adj hours).mp.

128 job split$.mp.

129 on call.ti,ab.

130 oncall.mp.

131 as needed hour$.mp.

132 casual hour$.mp.

133 weekday$ swap$.mp.

134 week day$ swap$.mp.

135 weekend swap$.mp.

136 shift self select$.mp.

137 shift self-select$.mp.

138 week$ on week$ off.mp.

139 term time work$.mp.

140 term-time work$.mp.

141 buyable leave.mp.

142 flexi week$.mp.

143 flexi year$.mp.

144 performance related pay.mp.

145 performance-related pay.mp.

146 adoption leave.mp.

147 adoption leave scheme$.mp.

148 flexi$ lunch hour$.mp.

149 paternity scheme$.mp.

150 parental leave scheme$.mp.

151 dependent$ leave.mp.

152 dependent$ leave scheme$.mp.

153 special leave.mp.

154 fixed term contract$.mp.

155 fixed-term contract$.mp.

156 (temp$ employ$ or temp$ contract$).ti,ab.

157 marginal employ$.mp.

158 contingent employ$.mp.

159 atypical employ$.mp.

160 carer$ leave.mp.

161 unpaid leave.mp.

162 precarious work$.mp.

163 work life polic$.mp.

164 occasional flexibil$.mp.

165 (work adj2 life adj2 polic$).mp.

166 (occasional adj2 flexibil$).

167 (reduc$ adj 2hours).ti,ab.

168 job$1 sharing.mp.

169 (Compress$ adj2 hours).mp

170 (Stagger$ adj2 hours).mp.

171 (Annuali?ed adj2 hours).mp.

172 (compress$ adj2 week).mp.

173 ((day or night or late or early or evening or core or stagger$ or compress$ or irregular) adj2 (work$ or shift$1 or hours$)).

174 Sabbatical$.mp.

175 Secondment$.mp.

176 (career$ adj3 break$). 177 home working.mp.

178 (work$ adj2 home).mp179 maternal leave.mp.

180 paternal leave.mp.

181 ((work life or worklife) adj2 balance$).

182 (flexible adj2 contract$).

183 adapt$ hours.mp.

184 time banking.mp.

185 work hour$1 restriction$.mp.

186 or/54-185

187 work/ or workplace/ or employment/

188 ((company or companies) adj5 (work$ or employ$ or job$ or staff or personnel or business$)).ti,ab.

189 (factory or factories or human resource$ or Business$).ti,ab.

190 ("Small and medium enterprises" or SMEs).ti,ab.

191 (worker$ or workplace$ or worksite$ or staff or personnel).ti,ab.

192 (employee$ or employer$).ti,ab.

193 (work$ adj3 office$).ti,ab.

194 (work place$ or work site$ or work location$ or work setting$).ti,ab.

195 ((job$ or employment) adj2 (place$ or site$ or location$ or setting$)).ti,ab.

196 or/187-195

197 196 and 186 and 53

IBSS (International Bibliography of the Social Sciences) (1951 -) (Ebsco)

Searched 19 June 2009

428 records retrieved

S226 (S224 and S225)

S225 (S64 and S199)

S224 S200 or S201 or S202 or S204 or S205 or S206 or S207 or S208 or S209 or S210 or S212 or S213 or S214 or S215 or S216 or S217 or S218 or S219 or S220 or S221 or S222

S223 TX ((job* or employment) w2 (place* or site* or location* or setting*))

S222 TX work setting*

S221 TX work location*

S220 TX work site*

S219 TX work place*

S218 TX (work* w3 office*)

S217 TX employer*

S216 TX employee*

S215 TX personnel

S214 TX staff

S213 TX worksite*

S212 TX workplace*

S211 TX workerplace*

S210 TX worker*

S209 TX Business*

S208 TX human resource*

S207 TX factories

S206 TX factory

S205 TX SMEs

S204 TX "Small and medium enterprises"

S203 TX ((company or companies) w5 (work* or employ* or job* or staff or personnel or business*))

S202 TX employment

S201 TX workplace

S200 TX work

S199 (S65 or S66 or S67 or S68 or S69 or S70 or S71 or S72 or S73 or S74 or S75 or S80 or S81 or S82 or S85 or S87 or S88 or S89 or S90 or S91 or S92 or S93 or S94 or S95 or S96 or S97 or S98 or S99 or S100 or S101 or S102 or S103 or S105 or S106 or S107 or S108 or S109 or S110 or S111 or S112 or S113 or S114 or S115 or S116 or S117 or S121 or S123 or S125 or S126 or S127 or S128 or S129 or S130 or S131 or S135 or S138 or S139 or S140 or S150 or S151 or S155 or S156 or S162 or S162 or S166 or S167 or S168 or S169 or S170 or S171 or S172 or S173 or S174 or S175 or S176 or S178 or S180 or S183 or S184 or S185 or S187 or S188 or S189 or S190 or S191 or S194 or S196 or S198)(S65 or S66 or S67 or S68 or S69 or S70 or S71 or S72 or S73 or S74 or S75 or S80 or S81 or S82 or S85 or S87 or S88 or S89 or S90 or S91 or S92 or S93 or S94 or S95 or S96 or S97 or S98 or S99 or S100 or S101 or S102 or S103 or S105 or S106 or S107 or S108 or S109 or S110 or S111 or S112 or S113 or S114 or S115 or S116 or S117 or S121 or S123 or S125 or S126 or S127 or S128 or S129 or S130 or S131 or S135 or S138 or S139 or S140 or S150 or S151 or S155 or S156 or S162 or S162 or S166 or S167 or S168 or S169 or S170 or S171 or S172 or S173 or S174 or S175 or S176 or S178 or S180 or S183 or S184 or S185 or S187 or S188 or S189 or S190 or S191 or S194 or S196 or S198)(S65 or S66 or S67 or S68 or S69 or S70 or S71 or S72 or S73 or S74 or S75 or S80 or S81 or S82 or S85 or S87 or S88 or S89 or S90 or S91 or S92 or S93 or S94 or S95 or S96 or S97 or S98 or S99 or S100 or S101 or S102 or S103 or S105 or S106 or S107 or S108 or S109 or S110 or S111 or S112 or S113 or S114 or S115 or S116 or S117 or S121 or S123 or S125 or S126 or S127 or S128 or S129 or S130 or S131 or

S135 or S138 or S139 or S140 or S150 or S151 or S155 or S156 or S162 or S162 or S166 or S167 or S168 or S169 or S170 or S171 or S172 or S173 or S174 or S175 or S176 or S177 or S178 or S179 or S180 or S181 or S182 or S183 or S184 or S185 or S186 or S187 or S188 or S189 or S190 or S191 or S192 or S193 or S194 or S195 or S196 or S197 or S198)

S198 TX study leave

S197 TX work hour*1 restriction*

S196 TX time banking

S195 TX adapt* hours

S194 TX (flexible w2 contract*)

S193 TX (work life or work life) w2 (balance*)

S192 TX (work life or worklife) w2 (balance*)

S191 TX paternal leave

S190 TX maternal leave

S189 TX (work* w2 home)

S188 TX home working

S187 TX (career* w3 break*)

S186 TX ((day or night or late or early or evening or core or stagger* or compress* or irregular) w2 (work* or shift*1 or hours*))

S185 TX (compress* w2 week)

S184 TX (Annuali?ed w2 hours)

S183 TX (Stagger* w2 hours)

S182 TX (Compress* w2 hours)

S181 TX job*1 sharing

S180 TX (reduc* w2 hours)

S179 TX (occasional w2 flexibil*)

S178 TX (work w2 life w2 polic*)

S177 TX occasional flexibil*

S176 TX work life polic*

S175 TX precarious work*

S174 TX unpaid leave

S173 TX carer* leave

S172 TX atypical employ*

S171 TX contingent employ*

S170 TX marginal employ*

S169 TX temp* contract*

S168 TX temp* employ*

S167 TX fixed-term contract*

S166 TX fixed term contract*

S165 TX special leave

S164 TX dependent* leave scheme*

S163 TX dependent* leave

S162 TX parental leave scheme*

S 161 TX paternity scheme*

S160 TX paternity leave scheme*

S159 TX flexi* lunch hour*

S158 TX adoption leave scheme*

S157 TX adoption leave

S156 TX performance-related pay

S155 TX performance related pay

S154 TX flexi year*

S153 TX flexi week*

S152 TX buyable leave

S151 TX term-time work*

S150 TX term time work*

S149 TX week* on week* off

S148 TX shift self-select*

S147 TX shift self select*

S146 TX weekend swap*

S145 TX week day* swap*

S144 TX weekday* swap*

S143 TX casual hour*

S142 TX as needed hours

S141 TX oncall

S140 TX on call

S139 TX job split*

S138 TX (reduce* hours)

S137 TX flexibreak*

S136 TX flexi break*

S135 TX time bank*

S134 TX time in lieu

S133 TX stagger* hours

S132 TX core hours

S131 TX adjust* hours

S130 TX piece work*

S129 TX piecework*

S128 TX day work*

S127 TX daywork*

S126 TX zero hours

S125 TX working time directive*

S124 TX flexible salary form*

S123 TX flexible contract*

S122 TX work place flexibility

S121 TX workplace flexibility

S120 TX professional* help* with household work*

S119 TX professional* help* with housework

S118 TX professional* help* with childcare

S117 TX freelance*

S116 TX free-lance*

S115 TX free-lance* work*

S114 TX freelance* work*

S113 TX non-standard employ* contract*

S112 TX non standard* employ* contract*

S111 TX paternity leave

S110 TX maternity leave

S109 TX early retirement

S108 TX pension scheme*

S107 TX retirement scheme*

S106 TX (phase* w2 retire*)

S105 TX irregular work*

S104 TX irregular work* hours

S103 TX telework*

S102 TX work* from home

S101 TX homework*

S100 TX home work*

S99 TX secondment

S98 TX sabbatical

S97 TX long term leave

S96 TX parental leave

S95 TX nightwork*

S94 TX night work*

S93 TX shift work*

S92 TX shiftwork*

S91 TX overtime

S90 TX compress* work* week*

S89 TX annualized hour*

S88 TX annualised hour*

S87 TX annual* hour*

S86 TX stagger* hour*

S85 TX job-shar*

S84 TX compress* work* hour*

S83 TX Job*1 share*

S82 TX weekend work*

S81 TX part time work*

S80 TX part-time work*

S79 TX unusual hour*

S78 TX self-schedul*

S77 TX "self schedul*"

S76 TX work schedule tolerance

S75 TX flexible work* hour*

S74 TX flexible work* arrangement*

S73 TX flexi-time*

S72 TX flextime*

S71 TX flex time*

S70 TX flexitime*

S69 TX flexi time*

S68 TX flexible work* time*

S67 TX flexible work* condition*

S66 TX flexible workplace

S65 TX flexible work*

S64 S1 or S2 or S3 or S4 or S6 or S7 or S9 or S10 or S11 or S12 or S13 or S14 or S15 or S16 or S17 or S18 or S19 or S20 or S21 or S22 or S23 or S24 or S25 or S26 or S27 or S29 or S30 or S31 or S35 or S36 or S37 or S38 or S39 or S41 or S42 or S43 or S44 or S45 or S46 or S47 or S48 or S50 or S51 or S52 or S53 or S55 or S56 or S57 or S58 or S59 or S61 or S62 or S63 Search modes -

S63 TX depressed

S62 TX burnout

S61 TX stress

S60 TX ((facilitat* or enable*1 or enabling or barrier*1 or obstruct* or encourage* or prevent* or time or free or disrupt* or relationship* or conflict) w2 (cooking or cleaning))

S59 TX cholesterol

S58 TX free time

S57 TX free-time

S56 TX social network*

S55 TX social activit*

S54 TX ((facilitat* or enable*1 or enabling or barrier*1 or obstruct* or encourage* or prevent* or time or free or disrupt* or relationship* or conflict) w3 (household work or house work or chores or hobbies or hobby or friends or family))

S53 TX EQ-5d

S52 TX euroqol

S51 TX SF-36

S50 TX short form 36

S49 TX functional limitations profile

S48 TX overweight

S47 TX obese

S46 TX obesity

S45 TX blood pressure

S44 TX mcGill pain questionnaire

S43 TX general health questionnaire

S42 TX quality of life

S41 TX days off

S40 TX ((GP or hospital or doctors or gps) w2 (consultation*1 or appointment*1))

S39 TX sick* leave

S38 TX sick* absence*

S37 TX ill

S36 TX illness

S35 TX health of worker*

S34 TX (employee* or staff) w2 (health)

S33 TX ((employee* or staff) w2 health))

S32 TX ((employee* or staff) w2 health)

S31 TX general health

S30 TX health risk*

S29 TX physical health

S28 TX ((promot* or manag* or facilitat* or enable*1 or enabling or barrier*1 or increas* or obstruct* or encourag* or prevent* or time or free or disrupt* or relationship* or conflict) w2 (health or healthy or healthier))

S27 TX health

S26 TX (musculo w2 skeletal w2 disorder*)

S25 TX (musculoskeletal w2 disorder*)

S24 TX work family conflict*

S23 TX work-life balance

S22 TX work life balance

S21 TX decision latitude

S20 TX empower*

S19 TX job satisfaction

S18 TX "quality of life"

S17 TX well-being

S16 TX depression

S15 TX wellbeing

S14 TX psychological stress

S13 TX professional burnout

S12 TX anxiety

S11 TX psychological outcome*

S10 TX mental health

S9 TX hypertension

S8 TX heart diseases

S7 TX heart diseases

S6 TX cardiovascular diseases

S5 TX lumbago

S4 TX low back pain

S3 TX lbp

S2 TX back pain

S1 TX morbidity

MEDLINE (1950 -) (Ovid)

Searched 30 March 2009

3055 records retrieved

1 exp Morbidity/ or morbidity.ti,ab.

2 exp Back Pain/

3 backpain.mp.

4 lbp.mp.

5 exp Low Back Pain/

6 lumbago.mp.

7 exp Cardiovascular Diseases/

8 exp Heart Diseases/

9 exp Hypertension/

10 exp Mental Health/

11 psychological outcome$.mp.

12 exp Anxiety/

13 exp Burnout, Professional/

14 exp Stress, Psychological/

15 wellbeing.mp.

16 exp Depression/

17 well-being.mp.

18 exp "Quality of Life"/

19 exp Job Satisfaction/

20 empower$.mp.

21 decision latitude.mp.

22 work life balance.mp

23 work-life balance.mp

24 work family conflict$.mp.

25 (musculoskeletal adj2 disorder$).mp.

26 (musculo adj2 skeletal adj2 disorder$).mp.

27 exp health/

28 ((promot$ or manag$ or facilitat$ or enable$1 or enabling or barrier$1 or increas$ or

obstruct$ or encourag$ or prevent$ or time or free or disrupt$ or relationship$ or conflict) adj2 (health or healthy or healthier)).ti,ab.

29 (mental health or physical health or health risk$ or general health).ti,ab.

30 ((employee$ or staff) adj2 health).ti,ab.

31 health of worker$.ti,ab.

32 illness.ti,ab.

33 ill.ti,ab.

34 sick$ absence$.ti,ab.

35 sick$ leave.ti,ab.

36 ((GP or hospital or doctor or gps) adj2 (consultation$1 or appointment$1)).ti,ab.

37 days off.ti,ab.

38 quality of life.ti,ab.

39 general health questionnaire.ti,ab.

40 mcGill pain questionnaire.ti,ab.

41 blood pressure.ti,ab.

42 hypertension.ti,ab.

43 (obesity or obese or overweight).ti,ab.

44 back pain.ti,ab.

45 functional limitations profile.ti,ab.

46 (short form 36 or SF-36).ti,ab.

47 (euroqol or EQ-5d).ti,ab.

48 ((facilitat$ or enable$1 or enabling or barrier$1 or obstruct$ or encourag$ or prevent$ or time or free or disrupt$ or relationship$ or conflict) adj3 (household work or house work or chores or hobbies or hobby or friends or family)).ti,ab.

49 (social activit$ or social network$ or social life or free-time or free time).ti,ab.

50 cholesterol.ti,ab.

51 ((facilitat$ or enable$1 or enabling or barrier$1 or obstruct$ or encourag$ or prevent$ or time or free or disrupt$ or relationship$ or conflict) adj2 (cooking or cleaning)).ti,ab.

52 (stress or burnout or depression or depressed).ti,ab.

53 or/1-52

54 flexible work$.ti,ab.

55 flexible workplace.ti,ab.

56 flexible work$ condition$.ti,ab.

57 flexible work$ time$.ti,ab.

58 flexi time$.ti,ab.

59 flexitime$.ti,ab.

60 flex time$.ti,ab.

61 flextime$.ti,ab.

62 flexi-time$.ti,ab

63 flexible work$ arrangement$.mp.

64 flexible work$ hour$.mp.

65 exp Work Schedule Tolerance/

66 "self schedul$".ti,ab.

67 self-schedule$.ti,ab.

68 unusual hour$.ti,ab.

69 part-time work$.ti,ab.

70 part time work$.ti,ab.

71 weekend work$.ti,ab.

72 Job$1 share$.ti,ab.

73 compress$ work$ hour$.ti,ab.

74 job-shar$.ti,ab.

75 stagger$ hour$.ti,ab.

76 annual$ hour$.ti,ab.

77 annualised hour$.mp.

78 annualized hour$.mp.

79 compress$ work$ week$.mp.

80 overtime.mp.

81 shiftwork$.mp.

82 shift work$.mp.

83 night work$.mp.

84 nightwork$.mp.

85 exp Parental Leave/

86 long term leave.mp.

87 sabbatical.mp.

88 secondment.mp

89 home work$.ti,ab.

90 homework$.ti,ab.

91 work$ from home.mp.

92 telework$.mp.

93 irregular work$ hours.mp.

94 irregular work$.mp.

95 (phase$ adj2 retire$).ti,ab.

96 retirement scheme$.mp.

97 pension scheme$.mp.

98 early retirement.mp.

99 maternity leave.mp.

100 paternity leave.mp.

101 non standard$ employ$ contract$.ti,ab.

102 non-standard employ$ contract$.ti,ab.

103 freelance$ work$.mp.

104 free-lance$ work$.mp

105 free-lance$.mp.

106 freelance$.mp.

107 professional$ help$ with childcare.mp.

108 professional$ help$ with housework.mp.

109 professional$ help$ with household work$.mp.

110 workplace flexibility.mp.

111 work place flexibility.mp.

112 flexible contract$.mp.

113 flexible salary form$.mp.

114 working time directive$.mp.

115 zero hours.mp.

116 daywork$.mp.

117 day work$.mp

118 piecework$.mp.

119 piece work$.mp.

120 adjust$ hours.mp.

121 core hours.mp.

122 stagger$ hours.mp.

123 time in lieu.mp.

124 time bank$.mp.

125 flexi break$.mp.

126 flexibreak$.mp.

127 (reduc$ adj hours).mp.

128 job split$.mp.

129 on call.ti,ab.

130 oncall.mp.

131 as needed hour$.mp.

132 casual hour$.mp.

133 weekday$ swap$.mp.

134 week day$ swap$.mp.

135 weekend swap$.mp.

136 shift self select$.mp.

137 shift self-select$.mp.

138 week$ on week$ off.mp.

139 term time work$.mp.

140 term-time work$.mp

141 buyable leave.mp.

142 flexi week$.mp.

143 flexi year$.mp.

144 performance related pay.mp.

145 performance-related pay.mp.

146 adoption leave.mp.

147 adoption leave scheme$.mp.

148 flexi$ lunch hour$.mp.

149 paternity scheme$.mp.

150 parental leave scheme$.mp.

151 dependent$ leave.mp.

152 dependent$ leave scheme$.mp.

153 special leave.mp.

154 fixed term contract$.mp.

155 fixed-term contract$.mp.

156 (temp$ employ$ or temp$ contract$).ti,ab.

157 marginal employ$.mp.

158 contingent employ$.mp.

159 atypical employ$.mp.

160 carer$ leave.mp.

161 unpaid leave.mp.

162 precarious work$.mp.

163 work life polic$.mp.

164 occasional flexibil$.mp.

165 (work adj2 life adj2 polic$).mp.

166 (occasional adj2 flexibil$).mp.

167 (reduc$ adj 2hours).ti,ab.

168 job$1 sharing.mp.

169 (Compress$ adj2 hours).mp.

170 (Stagger$ adj2 hours).mp.

171 (Annuali?ed adj2 hours).mp.

172 (compress$ adj2 week).mp.

173 ((day or night or late or early or evening or core or stagger$ or compress$ or irregular) adj2 (work$ or shift$1 or hours$)).mp.

174 Sabbatical$.mp.

175 Secondment$.mp.

176 (career$ adj3 break$).mp.

177 home working.mp.

178 (work$ adj2 home).mp.

179 maternal leave.mp.

180 paternal leave.mp.

181 ((work life or worklife) adj2 balance$).mp.

182 (flexible adj2 contract$).mp.

183 adapt$ hours.mp.

184 time banking.mp.

185 work hour$1 restriction$.mp.

186 or/54-185

187 work/ or workplace/ or employment/

188 ((company or companies) adj5 (work$ or employ$ or job$ or staff or personnel or business$)).ti,ab.

189 (factory or factories or human resource$ or Business$).ti,ab.

190 ("Small and medium enterprises" or SMEs).ti,ab.

191 (worker$ or workplace$ or worksite$ or staff or personnel).ti,ab

192 (employee$ or employer$).ti,ab.

193 (work$ adj3 office$).ti,ab.

194 (work place$ or work site$ or work location$ or work setting$).ti,ab.

195 ((job$ or employment) adj2 (place$ or site$ or location$ or setting$)).ti,ab.

196 or/187-195

197 196 and 186 and 53

PsycINFO (1806 -) (Ovid)

Searched 15 May 2009

1868 records retrieved

1 exp MORBIDITY/

2 MORBIDITY.ti,ab

3 exp BACK PAIN/

4 BackPain.ti,ab

5 (LOW AND BACK AND PAIN).ti,ab

6 lbp.ti,ab

7 lumbago.ti,ab

8 exp CARDIOVASCULAR DISORDERS/

9 exp HEART DISORDERS/

10 exp HYPERTENSION/

11 exp MENTAL HEALTH/

12 "psychological outcome$".ti,ab

13 exp ANXIETY/

14 burnout.ti,ab

15 exp PSYCHOLOGICAL STRESS/

16 Wellbeing.ti,ab

17 exp WELL BEING/

18 "psychological well being".ti,ab

19 (Well AND being).ti,ab

20 exp ATYPICAL DEPRESSION/ OR exp "DEPRESSION (EMOTION)"/ OR exp MAJOR DEPRESSION/ OR exp RECURRENT DEPRESSION/

21 well-being.ti,ab

22 exp "QUALITY OF LIFE"/

23 exp JOB SATISFACTION/

24 exp EMPOWERMENT/

25 "decision latitude".ti,ab

26 "work life balance".ti,ab

27 "work-life balance".ti,ab

28 "work family conflict$".ti,ab

29 (musculoskeletal adj2 disorder$).ti,ab

30 ((musculo adj2 skeletal adj2 disorder$)).ti,ab

31 exp HEALTH/

32 (promot$ OR manag$ OR facilitat$ OR enable$1 OR enabling OR barrier$1 OR increas$ OR obstruct$ OR encourag$ OR prevent$ OR time OR free OR disrupt$ OR relationship$ OR conflict).ti,ab

33 (health OR healthy OR healthier).ti,ab

34 (32 adj2 33).ti,ab

35 ((mental health OR physical health OR health risk$ OR general health)).ti,ab

36 (employee$ OR staff).ti,ab

37 health.ti,ab

38 (36 adj2 37).ti,ab

39 "Health of worker$".ti,ab

40 Illness.ti,ab

41 Ill.ti,ab

42 (sick$ AND absence$).ti,ab

43 (SICK AND LEAVE).ti,ab

44 (GP OR hospital OR doctor OR gps).ti,ab

45 (consultation$1 OR appointment$1).ti,ab

46 (44 adj2 45).ti,ab

47 (days AND off).ti,ab

48 exp "QUALITY OF LIFE"/

49 "general health questionnaire".ti,ab

50 "MCGILL PAIN QUESTIONNAIRE".ti,ab

51 exp BLOOD PRESSURE/

52 exp HYPERTENSION/

53 ((obesity OR obese OR overweight)).ti,ab

54 exp BACK PAIN/

55 "functional limitations profile".ti,ab

56 "SHORT FORM-36".ti,ab

57 "SF-36".ti,ab

58 ((euroqol OR EQ-5d)).ti,ab

59 facilitat$.ti,ab

60 enable$.ti,ab

61 enabling.ti,ab

62 barrier$.ti,ab

63 obstruct$.ti,ab

64 encourag$.ti,ab

65 prevent$.ti,ab

66 time.ti,ab

67 free.ti,ab

68 disrupt$.ti,ab

69 relationship$.ti,ab

70 conflict.ti,ab

71 59 OR 60 OR 61 OR 62 OR 63 OR 64 OR 65 OR 66 OR 67 OR 68 OR 69 OR 70

72 "household work".ti,ab

73 "house work".ti,ab

74 chores.ti,ab

75 hobbies.ti,ab

76 hobby.ti,ab

77 friends.ti,ab

78 family.ti,ab

79 72 OR 73 OR 74 OR 75 OR 76 OR 77 OR 78

80 (71 adj3 72).ti,ab

81 ((social activit$ OR social network$ OR social life OR free-time OR free time)).ti,ab

82 cholesterol.ti,ab

83 ((facilitat$ OR enable$1 OR enabling OR barrier$1 OR obstruct$ OR encourag$ OR prevent$ OR time OR free OR disrupt$ OR relationship $ OR conflict)).ti,ab

84 cooking.ti,ab

85 cleaning.ti,ab

86 84 OR 85

87 (83 adj2 86).ti,ab

88 ((stress OR burnout OR depression OR depressed)).ti,ab

89 1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14 OR 15 OR 16 OR 17 OR 18 OR 19 OR 20 OR 21 OR 22 OR 23 OR 24 OR 25 OR 26 OR 27 OR 28 OR 29 OR 30 OR 31 OR 34 OR 35 OR 38 OR 39 OR 40 OR 41 OR 42 OR 43 OR 46 OR 47 OR 48 OR 49 OR 50 OR 51 OR 52 OR 53 OR 54 OR 55 OR 56 OR 57 OR 58 OR 80 OR 81 OR 82 OR 87 OR 88

90 "flexible work$".ti,ab

91 "flexible workplace".ti,ab

92 "flexible work$ condition$".ti,ab

93 "flexible work$ time$".ti,ab

94 "flexi time$".ti,ab

95 flexitime$.ti,ab

96 "flex time$".ti,ab

97 flextime$.ti,ab

98 flexi-time$.ti,ab

99 "flexible work$ arrangement$".ti,ab

100 "flexible work$ hour$".ti,ab

101 "Work Schedule Tolerance".ti,ab

102 "self schedul$".ti,ab

103 "self-schedule$".ti,ab

104 "unusual hour$".ti,ab

105 "part-time work$".ti,ab

106 "part time work$".ti,ab

107 "weekend work$".ti,ab

108 "Job$1 share$".ti,ab

109 "compress$ work$ hour$".ti,ab

110 job-shar$.ti,ab

111 "stagger$ hour$".ti,ab

112 "annual$ hour$".ti,ab

113 "annualised hour$".ti,ab

114 "annualized hour$".ti,ab

115 "compress$ work$ week$".ti,ab

116 overtime.ti,ab

117 shiftwork$.ti,ab

118 "shift work$".ti,ab

119 "night work$".ti,ab

120 nightwork$.ti,ab

121 "Parental Leave".ti,ab

122 "long term leave".ti,ab

123 sabbatical.ti,ab

124 secondment.ti,ab

125 "home work$".ti,ab

126 homework$.ti,ab

127 "work$ from home".ti,ab

128 telework$.ti,ab

129 "irregular work$ hours".ti,ab

130 "irregular work$".ti,ab

131 ((phase$ adj2 retire$)).ti,ab

132 "retirement scheme$".ti,ab

133 "pension scheme$".ti,ab

134 "early retirement".ti,ab

135 "maternity leave".ti,ab

136 "paternity leave".ti,ab

137 "non standard$ employ$ contract$".ti,ab

138 "non-standard employ$ contract$".ti,ab

139 "freelance$ work$".ti,ab

140 "free-lance$ work$".ti,ab

141 free-lance$.ti,ab

142 freelance$.ti,ab

143 "professional$ help$ with childcare".ti,ab

144 "professional$ help$ with housework".ti,ab

145 "professional$ help$ with household work$".ti,ab

146 "workplace flexibility".ti,ab

147 "work place flexibility".ti,ab

148 "flexible contract$".ti,ab

149 "flexible salary form$".ti,ab

150 "working time directive$".ti,ab

151 "zero hours".ti,ab

152 daywork$.ti,ab

153 "day work$".ti,ab

154 piecework$.ti,ab

155 "piece work$".ti,ab

156 "adjust$ hours".ti,ab

157 "core hours".ti,ab

158 "stagger$ hours".ti,ab

159 "time in lieu".ti,ab

160 "time bank$".ti,ab

161 "flexi break$".ti,ab

162 flexibreak$.ti,ab

163 ((reduc$ ADJ hours)).ti,ab

164 "job split$".ti,ab

165 "on call".ti,ab

166 oncall.ti,ab

167 "as needed hour$".ti,ab

168 "casual hour$".ti,ab

169 "weekday$ swap$".ti,ab

170 "week day$ swap$".ti,ab

171 "weekend swap$".ti,ab

172 "shift self select$".ti,ab

173 "shift self-select$".ti,ab

174 "week$ on week$ off".ti,ab

175 "term time work$".ti,ab

176 "term-time work$".ti,ab

177 "buyable leave".ti,ab

178 "flexi week$".ti,ab

179 "flexi year$".ti,ab

180 "performance related pay".ti,ab

181 "performance-related pay".ti,ab

182 "adoption leave".ti,ab

183 "adoption leave scheme$".ti,ab

184 "flexi$ lunch hour$".ti,ab

185 "paternity scheme$".ti,ab

186 "parental leave scheme$".ti,ab

187 "dependent$ leave".ti,ab

188 "dependent$ leave scheme$".ti,ab

189 "special leave".ti,ab

190 "fixed term contract".ti,ab

191 "fixed-term contract$".ti,ab

192 ((temp$ employ$ OR temp$ contract$)).ti,ab

193 "marginal employ$".ti,ab

194 "contingent employ$".ti,ab

195 "atypical employ$".ti,ab

196 "carer$ leave".ti,ab

197 "unpaid leave".ti,ab

198 "precarious work$".ti,ab

199 "work life polic$".ti,ab

200 "occasional flexibil$".ti,ab

201 ((work adj2 life adj2 polic$)).ti,ab

202 occasional.ti,ab

203 flexibil$.ti,ab

204 (202 adj2 203).ti,ab

205 "job$1 sharing".ti,ab

206 ((Compress$ adj2 hours)).ti,ab

207 ((Stagger$ adj2 hours)).ti,ab

208 ((Annuali?ed adj2 hours)).ti,ab

209 ((compress$ adj2 week)).ti,ab

210 ((day OR night OR late OR early OR evening OR core OR stagger$ OR compress$ OR irregular)).ti,ab

211 ((work$ OR shift$1 OR hours$)).ti,ab

212 (210 adj2 211).ti,ab

213 Sabbatical$.ti,ab

214 Secondment$.ti,ab

215 ((career$ adj3 break$)).ti,ab

216 "home working".ti,ab

217 ((work$ adj2 home)).ti,ab

218 "maternal leave".ti,ab

219 "paternal leave".ti,ab

220 ((work life OR worklife)).ti,ab

221 balance$.ti,ab

222 (220 adj2 221).ti,ab

223 ((flexible adj2 contract$)).ti,ab

224 "adapt$ hours".ti,ab

225 "time banking".ti,ab

226 "work hour$1 restriction$".ti,ab

227 90 OR 91 OR 92 OR 93 OR 94 OR 95 OR 96 OR 97 OR 98 OR 99 OR 100 OR 101 OR 102 OR 103 OR 104 OR 105 OR 106 OR 107 OR 108 OR 109 OR 110 OR 111 OR 112 OR 113 OR 114 OR 115 OR 116 OR 117 OR 118 OR 119 OR 120 OR 121 OR 122 OR 123 OR 124 OR 125 OR 126 OR 127 OR 128 OR 129 OR 130 OR 131 OR 132 OR 133 OR 134 OR 135 OR 136 OR 137 OR 138 OR 139 OR 140 OR 141 OR 142 OR 143 OR 144 OR 145 OR 146 OR 147 OR 148 OR 149 OR 150 OR 151 OR 152 OR 153 OR 154 OR 155 OR 156 OR 157 OR 158 OR 159 OR 160 OR 161 OR 162 OR 163 OR 164 OR 165 OR 166 OR 167 OR 168 OR 169 OR 170 OR 171 OR 172 OR 173 OR 174 OR 175 OR 176 OR 177 OR 178 OR 179 OR 180 OR 181 OR 182 OR 183 OR 184 OR 185 OR 186 OR 187 OR 188 OR 189 OR 190 OR 191 OR 192 OR 193 OR 194 OR 195 OR 196 OR 197 OR 198 OR 199 OR 200 OR 201 OR 204 OR 205 OR 206 OR 207 OR 208 OR 209 OR 212 OR 213 OR 214 OR 215 OR 216 OR 217 OR 218 OR 219 OR 222 OR 223 OR 224 OR 225 OR 226

228 (work OR workplace OR employment).ti,ab

229 ((company OR companies) adj5 (work$ OR employ$ OR job$ OR staff OR personnel OR business$)).ti,ab

230 ((factory OR factories OR human resource$ OR Business$)).ti,ab

231 (("Small and medium enterprises" OR SMEs)).ti,ab

232 ((worker$ OR workplace$ OR worksite$ OR staff OR personnel)).ti,ab

233 ((employee$ OR employer$)).ti,ab

234 ((work$ adj3 office$)).ti,ab

235 ((work place$ OR work site$ OR work location$ OR work setting$)).ti,ab

236 ((job$ OR employment)).ti,ab

237 ((place$ OR site$ OR location$ OR setting$)).ti,ab

238 (236 adj2 237).ti,ab

239 228 OR 229 OR 230 OR 231 OR 232 OR 233 OR 234 OR 235 OR 238

240 89 and 227 and 239

Sociological Abstracts (1963 -) (CSA Illumina)

Searched 16 June 2009

1654 records retrieved

((DE=(health or wellbeing or well-being) or DE=morbidity)
or(KW=((back pain) or Backpain or lbp) or KW=((low back pain) or lumbago
or (cardiovascular diseases)) or KW=((heart diseases) or hypertension or
(mental health))) or(KW=((psychological outcome*) or Anxiety or
(Professional burnout)) or KW=((Psychological stress) or depression or
("quality of life")) or KW=((job satisfaction) or Empower* or (decision
latitude))) or(KW=((work life balance) or (work-life balance) or (work
family conflict*)) or KW=(musculoskeletal within 2 disorder*))
or(KW=(musculo within 2 skeletal within 2 disorder*)) or(KW=((promot* or
manag* or facilitat* or enable*1 or enabling or barrier*1 or increas* or
obstruct* or encourag* or prevent* or time or free or disrupt* or
relationship* or conflict) within 2 (health or healthy or healthier)))
or(KW=(mental health or physical health or health risk* or general
health)) or(KW=((employee* or staff) within 2 (health))) or(KW=((health
of worker*) or illness or ill) or KW=((sick* absence*) or (sick* leave)))
or(KW=((days off) or (quality of life) or (general health questionnaire))
or KW=((mcGill pain questionnaire) or (blood pressure) or (obesity or
obese or overweight)) or KW=((functional limitations profile) or (short
form 36 or SF-36) or (euroqol or EQ-5d))) or(KW=((facilitat* or enable*1
or enabling or barrier*1 or obstruct* or encourag* or prevent* or time or
free or disrupt* or relationship* or conflict) within 3 (household work or
house work or chores or hobbies or hobby or friends or family)))
or(KW=(social activit* or social network* or social life or free-time or
free time)) or(KW=cholesterol) or(KW=(stress or burnout or depression or
depressed))) and(((KW=((flexible work*) or shiftwork* or (shift work*))

or DE=((flexible work*) or shiftwork* or (shift work*))) or(KW=((non standard work*) or (non-standard work*) or (flexible time)) or DE=((non standard work*) or (non-standard work*) or (flexible time))) or(KW=((flexible workplace) or (flexible work* condition*)) or DE=((flexible workplace) or (flexible work* conditions) or (flexible time))) or(KW=((flexible work* time*) or (flexi time*) or flexitime*) or KW=((flex time*) or flextime* or flexi-time*) or KW=((flexible work* arrangement*) or (flexible work* hour*) or (work schedule tolerance))) or(KW=(("self schedule*") or self-schedule* or (unusual hour*)) or KW=((study leave) or (part-time work*) or (part time work*)) or KW=(weekend work*)) or(KW=(job* share*)) or(KW=((compress* work* hour*) or job-shar* or (stagger* hour*)) or KW=((annual* hour*) or (annualised hour*) or (annualized hour*)) or KW=((compress* work* week*) or overtime or (shift work*))) or(KW=(shiftwork* or (night work*) or nightwork*) or KW=((parental leave) or (long term leave) or sabbatical) or KW=(secondment or (home work*) or homework*)) or(KW=((work* from home) or telework* or (irregular work* hours)) or KW=((irregular work*) or (phase within 2 retire*) or (retirement scheme*)) or KW=((pension scheme*) or (early retirement) or (maternity leave))) or(KW=((non standard* employ* contract*) or (non-standard* employ* contract*) or (freelance* work*)) or KW=(free-lance* or (freelance* work*) or freelance*)) or(KW=((workplace flexibility) or (work place flexibility) or (flexible contract*)) or KW=((flexible salary form*) or (working time directive*) or (zero hours)) or KW=(daywork* or (day work*) or piecework*)) or(KW=((piece work*) or (adjust* hours) or (core hours)) or KW=((stagger* hours) or (time in lieu) or (time bank*)) or KW=((flexi break*) or flexibreak*)) or(KW=((reduc* hours) or (job split*) or (on call)) or KW=(oncall or (as needed hour*) or (casual hour*)) or KW=((weekday* swap*) or (week* day* swap*) or (weekday* swap*))) or(KW=((shift self select*) or (shift self-select*) or (week* on week* off)) or KW=((term time work*) or (term-time work*) or (buyable leave)) or KW=((flexi week*) or (flexi year*) or (performance related pay))) or(KW=((performance-related pay) or (adoption leave) or (adoption leave scheme*)) or KW=((flexi* lunch hour*) or (paternity scheme*) or (parental leave scheme*)) or KW=((dependent* leave) or (dependent* leave scheme*) or (special leave))) or(KW=((fixed

term contract*) or (fixed-term contract*) or (temp* employ* or temp* contract*))) or(KW=((marginal employ*) or (contingent employ*) or (atypical employ*)) or KW=((carer* leave) or (unpaid leave) or (precarious work*)) or KW=((work life polic*) or (occasional flexibil*))) or(KW=(work within 2 life within 2 polic*)) or(KW=((reduc* within 2 hours) or (job*1 sharing))) or(KW=((compress* within 2 hours) or (annualized within 2 hours) or (annualised within 2 hours))) or(KW=((day or night or late or early or evening or core or stagger* or compress* or irregular) within 2 (work* or shift*1 or hours*))) or(KW=(sabbatical* or secondment* or (career* within 3 break*)) or KW=((home working) or (work* within 2 home))) or(KW=((maternal leave) or (paternal leave) or (adapt* hours)) or KW=(time banking)) or(KW=((work life or worklife) within 2 (balance*))) or(KW=(flexible within 2 contract*))) and((KW=(work or workplace or employment)) or(KW=((company or companies) within 5 (work* or employ* or job* or staff or personnel or business*))) or(KW=(factory or factories or human resource* or Business*)) or(KW=("Small and medium enterprises" or SMEs)) or(KW=(worker* or workplace* or worksite* or staff or personnel)) or(KW=(employee* or employer*)) or(KW=(work within 3 office*)) or(KW=(work place* or work site* or work location* or work setting*)) or(KW=((job* or employment) within 2 (place* or site* or location* or setting*)))))

SSCI (Social Science Citation Index) (1970 -) (ISI Web of Knowledge)

Searched 22 May 2009

#26 #25 AND #24

#25 Topic=(follow-up or longitudinal or prospective* or cohort or evaluation or "before and after")

#24 #23 AND #22

#23 #19 AND #4

#22 #21 OR #20

#21 Topic=(worker or personnel or employee or employer or work setting* or work location*)

#20 Topic=(work or workplace or employment or compan* or business* or staff or job* or factory or factories or worksite*)

#19 #18 OR #17 OR #16 OR #15 OR #14 OR #13 OR #12 OR #11 OR #10 OR #9 OR #8 OR #7 OR #6 OR #5

#18 Topic=(reduc* hours or career break* or "working from home" or adapt* hours or time banking)

#17 Topic=(atypical employ* or carer* leave or unpaid leave or precarious work* or work life polic* or occasional flexibil*)

#16 Topic=(fixed term contract* or temp* employ* or temp* contract* or marginal employ* or contingent employ*)

#15 Topic=(flexi week* or flexi year* or flexi day* or performance related pay or parental leave scheme* or dependent* leave or special leave)

#14 Topic=(shift self select* or shift self-select* or "week* on week* off" or term-time work* or term time work* or buyable leave)

#13 Topic=(job split* or on call or oncall or on-call or "as needed hours" or casual hours or weekday* swap* or weekend swap*)

#12 Topic=(day work or daywork or piecework* or piece work* or adjust* hours or core hours or stagger* hours or tme in lieu or time bank* or flexi break* or flexibreak* or reduc* hours)

#11 Topic=(work* flexibility or flexible contract* or flexible salary form* or working time directive*)

#10 Topic=(maternity leave or paternity leave or adoption leave or non-standard employ* contract* or freelanc*)

#9 Topic=(home work* or homework* or work* from home or telework* or irregular work* or phase* retire*)

#8 Topic=(shiftwork* or shift work* or nightwork* or night work* or parental leave or long term leave or sabbatical or secondment)

#7 Topic=(job-shar* or job shar* or compress* work* hour* or stagger* hour* or annual* hour* or compress* work* week or overtime)

#6 Topic=(work schedule tolerance or self-schedul* or self schedul* or unusual hour* or part-time work* or part time work* or weekend work*)

#5 Topic=(flex* work* or flex* workplace or flex* work* condition* or flex* work* time* or flex* work* hours)

#4 #3 OR #2 OR #1

#3 Topic=(illness or ill or sick* absence* or sick leave or gp or hospital appointment* or medical consultation or doctor* appointment or days off or cholesterol or blood pressure or obesity or obese or "social wellbeing" or social life or free time)

#2 Topic=(wellbeing or well-being or depression or "quality of life" or job satisfaction or empower* or decision latitude or "work life balance" or work family conflict* or

musculoskeletal disorder* or health or physical health or health risk* or "general health" or health behaviour*)

#1 Topic=(morbidity or backpain or back pain or lbp or lumbago cardiovasular or heart disease* or hypertension or mental health or psychological outcome* or anxiety or burnout or stress)

Appendix 2. Study eligibility and data abstraction form

PART 1: Bibliographic details
Study ID
Reviewer ID
Date of review
Article citation
Language
Type (e.g. full paper, conference proceeding, unpublished report)
Corresponding author and contact details
Secondary publications
PART 2: Eligibility
Is the study a prospective cohort with control? (Y/N/Unclear)
Are the participants workers/employees? (Y/N/Unclear)
Does the study examine the effects of some type of flexible working intervention? (Y/N/Unclear)
Are primary outcomes (physical, mental general health) reported using a validated instrument? (Y/N/Unclear)
Are outcomes reported for a period 6 months or greater? (Y/N/Unclear)
Include/Exclude?
Reason for exclusion
PART 3: Type of flexibility
Type of flexibility intervention and intervention details
Was the flexible working arrangement actively chosen by the worker?
What were the reasons for the practice?
Were the arrangements likely to benefit the employer or the worker?
PART 4: Data extraction

(Continued)

Study population
Occupation
Type of worker (manual, non-manual)
Sex
Age
Country in which study was conducted
Date study was conducted
Study design & methods
Study design
Total study duration
Method of sampling (simple random, stratified, cluster etc.)
Method of recruitment
Total population
Baseline response (number & rate)
Time between baseline and follow ups
Follow-up response
Final sample size
Is potential confounding from attrition/non-response explored? Are adjustments made?
Is information about other potential confounders obtained (e.g. concurrent interventions, not all intervention group exposed)?
Data pertaining to control group
Control group selection (NS or method of randomisation or matching?)
Is demographic confounding between intervention and control groups explored? Any adjustment made?
Contamination between intervention and control group?
Outcome measures
List primary outcomes measured and validated instruments used (include physical health; mental health; general health)
List secondary outcomes measured and validated instruments used (include sickness absence; health service usage; lifestyle/behavioural changes; quality of life; work-life balance; health and wellbeing of children, family members and co-workers)

(Continued)

List organisational and economic outcomes (include staff turnover rates, job performance, job satisfaction, employee morale (note definitions used and scales but do not data extract)
Results
Briefly summarise the key effects of the intervention on the primary outcomes, scales used and P values, SE, SD, means, F ratios, CIs etc. Compare to control and give intervention group over time results
Briefly summarise the key effects of the intervention on the secondary outcomes, scales used and P values, SE, SD, means, F ratios, CIs etc. Compare to control and give intervention group over time results
Subgroup analyses (by age, gender, ethnicity, job type, socio-economic status)
Study authors' key conclusions
Miscellaneous
Funding source
References to other relevant studies
Correspondence required (request for clarification of methods or results)
Comments

Appendix 3. Quality appraisal criteria

1. Is there a representative sample? (e.g. random samples, adequately justified purposive sampling, or 100% samples)

2. Is there an appropriate control group? (e.g. random allocation, matched control)

3. Is the baseline response greater than 60%?

4. Is the follow-up response greater than 80%?

5. Have the authors adjusted for non-response and drop-out?

6. Are the authors' conclusions substantiated by the data presented?

7. Is there adjustment for the majority of known confounders (e.g. demographic, lifestyle, job content or flexible working experience)?

8. Is there evidence of protection from contamination?

9. Were appropriate statistical tests used?

Adapted from Bambra 2007; Bambra 2008a; Bambra 2008b; CRD 2001; Deeks 2003; Egan 2007.

CONTRIBUTIONS OF AUTHORS

Kerry Joyce: content and methodological experience, screened titles and abstracts, screened full text articles, undertook data extraction and critical appraisal, co-ordinated authors and lead writing of the review. Roman Pabayo: methodological and statistical expertise, undertook data extraction and critical appraisal, contributed to writing of the review. Julia Critchley: methodological and statistical expertise, contributed to writing of the review. Clare Bambra: content and methodological expertise, conceived and designed the project, secured funding for the review, screened titles and abstracts, undertook critical appraisal where disagreements between authors occurred; contributed to writing the review.

Abbreviations

CBA = controlled before and after study; CES-D = Center for Epidemiologic Studies Depression Scale; CI = confidence interval; Con = control; CWW = compressed working week; ESS = Epworth Sleepiness Scale; GHQ-12 = General Health Questionnaire; Int = Intervention; IPAQ = International Physical Activity Questionnaire; NS = non-significant; OR = odds ratio; PA = physical activity; RR = risk ratio; SD = standard deviation; SE = standard error; VBBA = Dutch Questionnaire on the Experience and Evaluation of Work; WLB = work-life balance; WHO World Health Organization

DECLARATIONS OF INTEREST

None known.

SOURCES OF SUPPORT

Internal sources

- No sources of support supplied

External sources

- Department of Health Incentive Scheme for Cochrane Reviews, UK.

  Award Reference Number: 17-08-N

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

With regard to handsearching a selection of relevant journals in the field, we searched *Ergonomics* rather than the *Journal of Human Ergology* as the searches retrieved more hits from the latter publication.

INDEX TERMS

Medical Subject Headings (MeSH)

*Family Health; *Health Status; *Occupational Health; *Work Schedule Tolerance [physiology] [psychology]; Internal-External Control; Randomized Controlled Trials as Topic

MeSH check words

Humans