

Creating healthy workplaces in Northern Ireland: evaluation of a lifestyle and physical activity assessment programme

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An observational study was carried out on 2595 Northern Ireland civil servants who attended a workplace lifestyle and physical activity assessment programme involving self-reported lifestyle history, measurement of physiological parameters and a 6 month follow-up postal questionnaire survey. Almost two-thirds of participants did not engage in regular moderate physical activity, with females twice as likely not to than men. Approximately one in six participants were smokers and three-quarters were found to have body fat estimations above the acceptable level, with females much more likely to be obese than men. Aerobic capacity was below average in 17% of participants and was associated with increasing age, smoking in the under 35s and poor physical activity levels. Excessive alcohol intake was found in 8% of all participants, and was more likely in men and smokers. In the follow-up survey, 83% needed to make one or more changes to their lifestyle. Smoking was the most difficult to change, with only 14% remaining abstinent after 6 months. Almost two-thirds were maintaining improved dietary habits and exercise activity, with around one-half moderating alcohol intake and achieving weight reduction. Overall, the average level of non-attempted behaviour change was one in five (19.6%), tried but failed accounted for almost one in three (31.2%) and successful maintenance of positive lifestyle change occurred in one-half (49.2%). Brief lifestyle and physical activity assessment programmes are effective interventions in getting employees to modify their lifestyles. The impact this has on wider organizational issues such as absenteeism and productivity needs further evaluation.

Key words: Healthy lifestyles; physical activity assessment; workplace health promotion; workplace interventions.

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Introduction

Healthy workplaces can help to prevent occupational disease and injury, as well as promoting positive lifestyle behaviours. The concept of creating healthy workplaces through workplace health promotion in Northern Ireland (NI) has previously been acknowledged as something that should be of interest to employees and employers [1]. Workplace health has three components: the effects of work on health; the effects of health on an individual's

capacity to work; and the opportunity for health promotion by the employer through a range of activities that encourage employees to adopt healthier lifestyles. The role of prevention in respect to work-related disease and injury is widely accepted. As an adjunct to that, and gaining increasing recognition, is the promotion of positive healthy lifestyle behaviours through workplace interventions.

In NI, successive governments have identified the workplace as a setting for promoting health through their strategies for promoting public health [2–4]. The Chief Medical Officer for NI, in her annual report for 1996 [5], also acknowledged that the workplace was an ideal location in which health promotion could take place,

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recognizing that it: offers access to large numbers of people who are part of the wider social community; provides the potential for positive health messages to be enhanced by team influences found within organizations; enables activity to be directed at individuals who may not be reached easily in other ways; and creates the possibility of extended dissemination of a positive healthy lifestyle culture to the family and friends of the employee outside of the targeted workplace.

Health promotion is the process of enabling people to increase control over, and to improve, their health [6], with the objective of maximizing people's ability to achieve their full health potential. Workplace health promotion is the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations [7]. In practice, it encompasses any activity, based in the workplace, which is aimed at improving the health of the employee, and is one of a number of 'settings approaches' that are being used across the world to contribute to improvements in general health and social well-being.

Research carried out by the Health Promotion Agency into workplace health promotion in NI in 1994 [8] showed that there was low employee health scheme provision. This was perhaps due in part to the perceived cost constraints of providing activities, but was probably also influenced by a lack of awareness about just how beneficial health promotion at work could be to both the organization and the individual. However, over 40% of employers interviewed during the survey expressed an interest in doing more to promote health at work.

The economic consequences for organizations of an unhealthy workforce are seen in high sickness absence and accidents at work, loss of productivity and increasing health-related litigation, all of which pose a significant cost [9]. The impact of work on the health and social well-being of employees is also recognized in work-related disease and the effects of the physical and psychosocial work environments. In a survey on self-reported work-related illness [10], the Health & Safety Executive estimated that 2 million people suffer from some form of work-related illness in the UK (musculoskeletal conditions accounting for just over 1.2 million, and stress 0.5 million). Based on these considerations, the obligation to promote health in the workplace would appear to be compelling.

The types of health promotion programme usually found in workplace settings include: those which address healthy lifestyles, smoking cessation, sensible drinking, heart disease prevention and mental health issues; employee fitness and exercise programmes; promoting healthy eating in works' canteens and dining halls; and cancer screening and information on prevention and early detection. Organizations operating health promotion policies have been reported to accrue a positive benefit as

far as managing absence was concerned when compared with those companies that did not [11]. In a major European study [12], the benefits were not solely related to health areas, but extended to include wider issues of organizational performance, such as investing in people and improving competitiveness, and included: morale and health improvements of the workplaces surveyed; reduced personnel and welfare problems; reduced absenteeism; increased productivity; reduced industrial relations disputes; lower accident rates; and improved company image. Other studies have confirmed that the employer also stands to benefit from improved attendance, increased efficiency and better overall performance from a healthier workforce [13].

Coronary heart disease (CHD) is the major cause of ill-health and death in NI, which has the highest rates of premature death in the European Union (EU)—93% above the EU rate for men and 173% above for women. Within the UK, the equivalent CHD rates for NI are 22% higher for men and 43% for women [2]. It is, therefore, the largest single cause of loss of useful years of life for the people of NI [5]. In addition to poor family history and being male, the lifestyle-based risk factors for CHD are high blood pressure, smoking, excessive alcohol consumption, obesity, poor dietary habits, stress and lack of physical activity [2,4].

In other words, there are many modifiable lifestyle factors, and these are targeted in health assessment programmes, which have become an important part of workplace health promotion. The rationale is to promote a change in lifestyle health-related behaviour—most commonly, alcohol consumption, smoking, exercise patterns and diet. Concerns have been raised with such assessments that suggest they only attract the worried well; appeal only to the higher socio-economic groups; have little impact; and induce anxiety in otherwise healthy individuals [14]. However, in a randomized controlled trial of health checks in a large engineering factory in Scotland, it was reported that recipients were prompted to engage in health-promoting behavioural changes and that the screening intervention did not induce stress [15].

Occupational health departments increasingly see one of their roles as encouraging physical fitness among employees, not least because of the general agreement that regular aerobic exercise is of benefit to health [16]. Studies have also shown that changing people from being sedentary to taking some activity has the greatest beneficial effect in reducing the risk of ischaemic heart events [17] and that the introduction of walking exercises has a modest but consistent effect on body fat [18]. Others have suggested that change in health-related behaviour is worthwhile even if it does not immediately impact on the classical CHD risk factors [14]. Such change could benefit general well-being, reduce the risk of other diseases and lead to a continuing change in

behaviour pattern that, over time, would ultimately lead to a reduction in CHD risk. In a systematic review of the effectiveness of over 100 workplace health promotion interventions, the factors identified by Harden *et al.* [19] as important were top management support with employee involvement, focus on modifiable risk factors, and a programme tailor made to the characteristics and needs of the workforce.

The reasons for developing holistic workplace health promotion are many and include: satisfying public health policy imperatives; building on existing commitments under health and safety legislation; and acknowledging the strong economic arguments and moral justification for wishing to create as healthy a workforce as possible. This study considers a practical workplace health promotion initiative as an example of an intervention aimed at encouraging employees to adopt positive healthy lifestyle behaviours.

Methods

Subjects and setting

The study was carried out in the Northern Ireland Civil Service (NICS), the administrative organization of central government in NI, with ~28 000 employees. The NICS Occupational Health Service (OHS) provides occupational health advice to all NICS departments and associated agencies, with health promotion activities forming a major part of that provision. A lifestyle and physical activity assessment (LPAA) programme is the main component of the health promotion campaign. Subjects were those civil servants who attended the LPAA between 1997 and 2000. They were categorized by age, gender and job grade, the latter forming two main categories: low grade—administrative assistants, administrative officers, cleaners, messengers, porters and industrial workers; and high grade—comprising those in higher administrative jobs and professional, scientific and technical staff.

Programme

The LPAA was a nurse-run programme, with assessments carried out on a full-time basis in the occupational health department in Belfast. Participation was voluntary, and employees attended from all over NI, having been given time off work to do so by their employing department/agency. The aim was primarily, but not exclusively, to attract those who were >35 years of age and sedentary in their lifestyle, with all employees having equal access to the programme regardless of, for example, employment location, job grade, gender and any perceived disability. As the LPAA took ~45 min to complete, it was possible to calculate the number of appointments available in the

forthcoming 12 month period. Invitations were then issued in advance to employees through an employer contact, e.g. a welfare officer, who acted as a coordinator in the workplace. The LPAA programme had a 12 month appointment scheduling cycle, and employing departments/agencies were allocated a quota of appointments in proportion to their share of the total number of employees within the NICS. Attendance rates were extremely high, with 90% uptake for initial appointments. For cancellations notified in advance, it was possible to re-offer appointments, and this brought the overall uptake to almost 95%, leaving the rate of unnotified non-attendance at the 5% level. The reasons given for non-attendance included sickness absence, unexpected urgent work commitments and forgetting the appointment. To minimize this aspect of the programme, the nurse assessor liaised closely with each workplace coordinator before appointments were allocated and, importantly, during the actual assessment periods. This approach undoubtedly ensures maximal uptake.

Those attending completed a pre-assessment questionnaire to establish current exercise activity levels, smoking status, dietary habits and alcohol consumption. Physiological measurements were recorded for each individual, comprising height, weight, body mass index, body fat, grip strength, urinalysis, blood pressure, serum cholesterol, stamina assessment using a stationary ergometer (exercise bicycle) and a flexibility test. Details of these parameters were entered into a commercial computer-based ergometric activity and lifestyle assessment system that is widely used throughout the UK and is scientifically validated [20].

The main elements of the LPAA recorded in this study are shown in Table 1. Each physiological/lifestyle parameter was grouped into two broad categories: normal and abnormal or 'at-risk'. This categorization was based on pre-set boundaries in the lifestyle assessment system and verified where appropriate against current clinical guidance [20–24].

Follow-up survey

Given the ongoing nature of the programme and the large size of the workforce, it was not feasible to recall subjects for further assessment. Participants in the LPAA were invited to enter a postal questionnaire follow-up survey to evaluate change in individual healthy lifestyle behaviour. A self-completed postal questionnaire was issued 6 months after attendance to those who had given their consent at the initial programme assessment. Respondents were asked whether they had been advised to make any change in their lifestyle and, if so, had they: not tried; tried but failed; or tried and successfully maintained a positive lifestyle change.

Table 1. Physiological and lifestyle measurements

Physical activity [20]	Inactive ^a Slightly active ^a Moderately active Very active Extremely active	Very sedentary lifestyle No regular exercise, but active lifestyle 30 min of exercise 3–4 times per week 1 h vigorous exercise 3–4 times per week 1 h strenuous exercise 5+ times per week																																																	
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^aCategory graded as 'at risk'.^bDepending on age.

Analysis

Six at-risk parameters were determined using physiological measurements (blood pressure, serum cholesterol estimation, aerobic capacity and body fat assessment) and self-recorded information (pre-programme physical activity level and average alcohol intake). These were evaluated against a range of denominators: sex, age, job grade and smoking status. It was acknowledged that

smoking was itself an important at-risk parameter; however, it was felt that smokers were a distinct subgroup whose performance in the LPAA merited individual assessment. For that reason and for the purposes of comparative analysis, it was decided to present smoking status as a denominator. Pearson's χ^2 test was used to assess the relationship between at-risk parameters and denominators (as dichotomous variables), with the level

of significance set at $P < 0.05$. Odds ratios (OR) with 95% confidence intervals (CI) were also calculated for the main statistically significant associations. Statistical analysis was performed using SISA [25].

Results

During the 3 year period of the study there were 2595 participants in the programme, the majority of whom were aged >35 years (85%). Males accounted for over half, and most of the participants were non-smokers (Figure 1). Compared with the whole workforce, the study group had a higher proportion of employees in the >35 age group (85 versus 44%), slightly more males (54 versus 48%) and more high-grade staff (67 versus 57%). The age profile was consistent with the stated intention of the LPAA programme to target the over 35s and the gender-job grade pattern of the participants was similar to the whole workforce profile for those aged ≥ 35 years.

The programme

Figure 2 shows the overall profile of the programme participants with regard to pre-assessment level of exercise activity, smoking status, alcohol consumption, serum cholesterol evaluation, blood pressure measurement, body fat estimation and aerobic capacity (VO_2).

Almost two-thirds of participants (59%) had pre-LPAA exercise activity levels described as inactive or slightly active (i.e. poor). Measured aerobic capacity was in the abnormal range for almost 17%. Approximately 8% of participants drank alcohol above the national limits

recommended for males and females. Only a small proportion (4%) were recorded as having blood pressure in the at-risk range. Serum cholesterol was elevated in 17% of participants, three-quarters (75.6%) had a body fat estimation above the acceptable range and smokers accounted for one in six (16.5%).

Table 2 shows the profile of those with at-risk physiological or lifestyle parameters by gender, job grade and age band. Smoking status is itself an at-risk factor; however, as already indicated, for the purposes of analysis it is presented as a denominator in this table. More females (67%) than males (54%) reported engaging in less physical activity pre-programme. The proportion of men taking exercise pre-programme decreased with increasing age, whilst in women that pattern was reversed. Job grade made little difference to exercise taken in both males and females. Male smokers (58%) engaged in slightly less exercise than their non-smoking colleagues (53%), whilst there was little difference between smokers (66%) and non-smokers (67%) in female participants.

Body fat showed a general rise with increasing age for both males and females, with little job grade difference. Slightly more male non-smokers (75%) than male smokers (68%) exhibited excess body fat, although this difference was not apparent in females. Overall, more females (78%) than males (74%) were in the excessive body fat category. The prevalence of hypertension in the participants was low, with more males (1.4%) than females (0.4%) in the at-risk blood pressure group.

Elevated serum cholesterol showed an increasing trend with increasing age in both males and females, and more males (23%) had raised cholesterol compared with

Figure 1. LPAA participants by sex, job grade category and age: 1997–2000 ($n = 2595$).

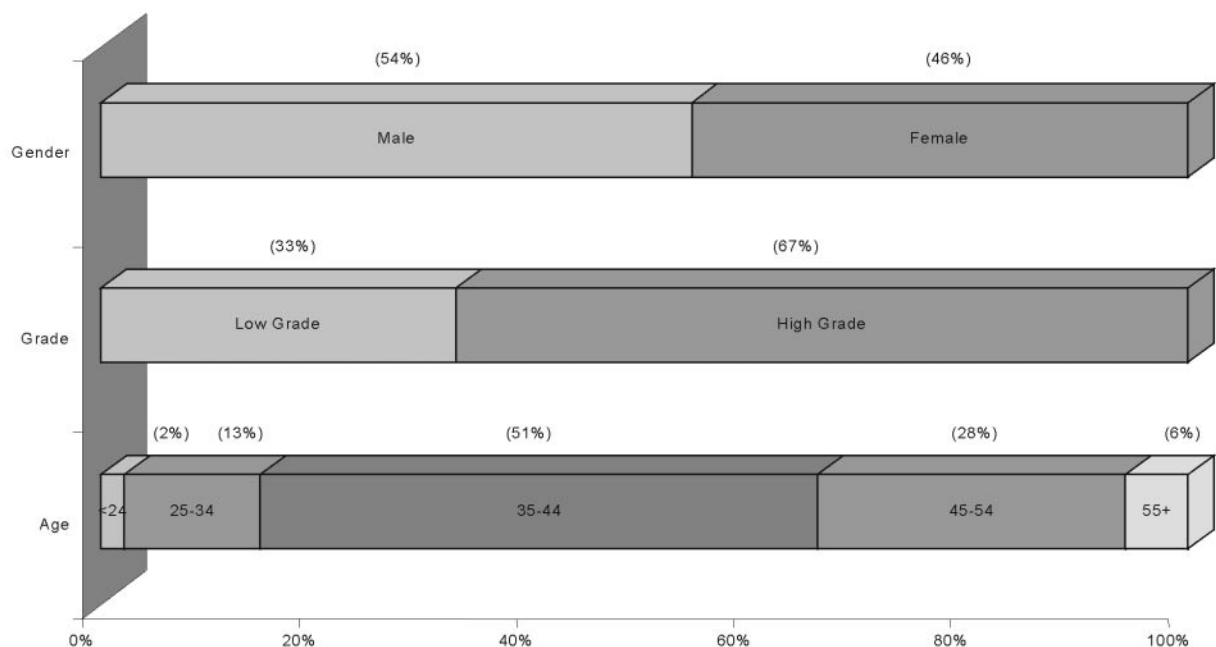
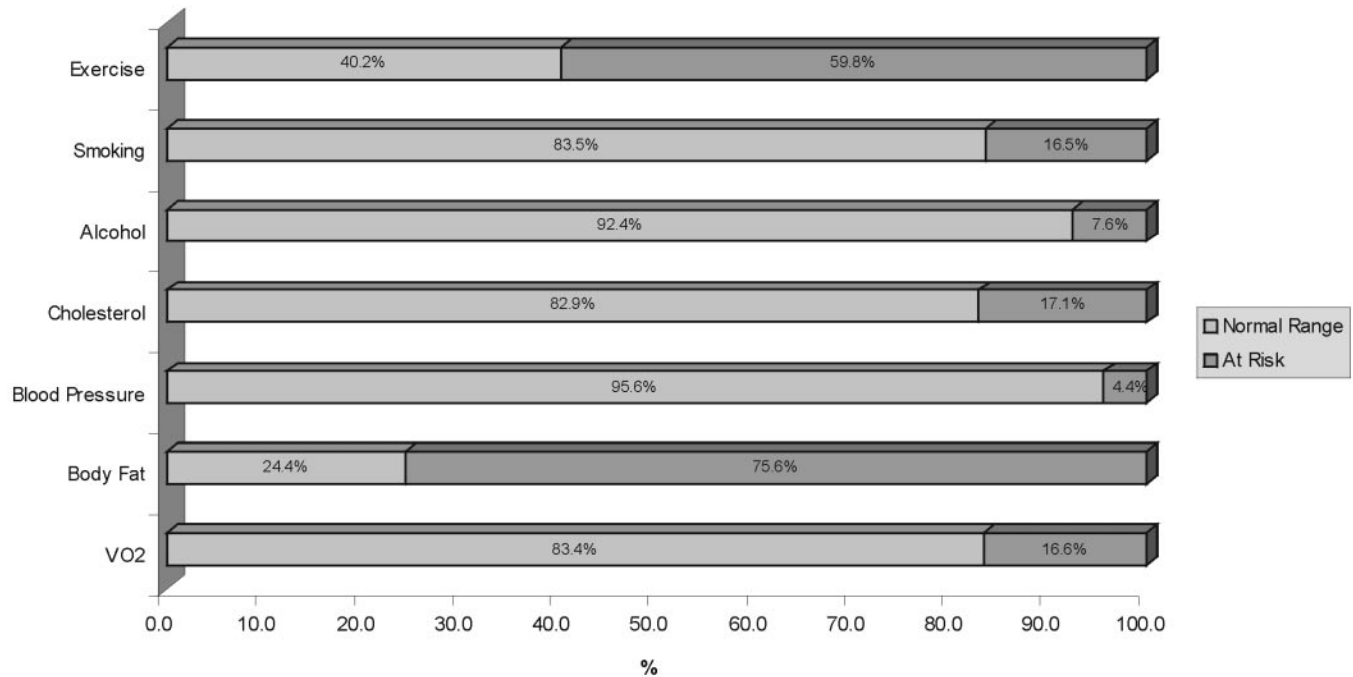


Figure 2. Physiological/lifestyle at-risk profile ($n = 2595$).**Table 2.** At-risk parameters by age, sex, job grade and smoking category ($n = 2595$)

	All participants	Low exercise pre-programme (%)	Body fat (%)	Diastolic BP >91 (%)	Cholesterol >6.5 mmol/l (%)	Alcohol excess (%)	VO ₂ below average (%)
Males							
Age							
<24	27	11 (40.74)	14 (51.9)	0 (0.0)	0 (0.0)	6 (22.2)	3 (11.1)
25–34	154	79 (51.3)	91 (59.1)	4 (2.6)	22 (14.3)	17 (11.0)	17 (11.0)
35–44	665	343 (51.58)	486 (73.1)	22 (3.3)	128 (19.2)	86 (12.9)	108 (16.2)
45–54	473	270 (57.08)	381 (80.5)	43 (9.1)	141 (29.8)	51 (10.8)	86 (18.2)
55+	89	51 (57.3)	67 (75.3)	17 (19.1)	27 (30.3)	7 (7.9)	15 (16.9)
Smoker	233	134 (57.51)	159 (68.2)	17 (7.3)	58 (24.9)	57 (24.5)	43 (18.5)
Non-smoker	1175	620 (52.77)	880 (74.9)	69 (5.9)	260 (22.1)	110 (9.4)	186 (15.8)
Grade 1	276	148 (53.62)	196 (71.0)	12 (4.3)	49 (17.8)	44 (15.9)	48 (17.4)
Grade 2	1132	606 (53.53)	843 (74.5)	74 (6.5)	269 (23.8)	123 (10.9)	181 (16.0)
All males	1408	754 (53.55)	1039 (73.8)	86 (6.1)	318 (22.6)	167 (11.9)	229 (16.3)
Females							
Age							
<24	29	19 (65.52)	19 (65.5)	0 (0.0)	2 (6.9)	1 (3.4)	1 (3.4)
25–34	171	117 (68.42)	113 (66.1)	0 (0.0)	7 (4.1)	8 (4.7)	16 (9.4)
35–44	664	460 (69.28)	501 (75.5)	6 (0.9)	45 (6.8)	16 (2.4)	114 (17.2)
45–54	265	166 (62.64)	238 (89.8)	18 (6.8)	56 (21.1)	4 (1.5)	59 (22.3)
55+	58	35 (60.34)	51 (87.9)	5 (8.6)	15 (25.9)	1 (1.7)	10 (17.2)
Smoker	196	129 (65.82)	149 (76.0)	3 (1.5)	18 (9.2)	11 (5.6)	26 (13.3)
Non-smoker	991	668 (67.41)	773 (78.0)	26 (2.6)	107 (10.8)	19 (1.9)	174 (17.6)
Grade 1	570	373 (65.44)	444 (77.9)	13 (2.3)	56 (9.8)	17 (3.0)	102 (17.9)
Grade 2	617	424 (68.72)	478 (77.5)	16 (2.6)	69 (11.2)	13 (2.1)	98 (15.9)
All females	1187	797 (67.14)	922 (77.7)	29 (2.4)	125 (10.5)	30 (2.5)	200 (16.8)

females (10.5%). Male smokers showed a slightly higher proportion of elevated cholesterol (25%) compared with non-smokers (22%). Males also showed a job grade

difference, with more in the higher grades (24%) having high cholesterol levels compared with those in the lower job grade category (18%). These smoking and job grade

differences in men for elevated serum cholesterol were not as evident in females.

Drinking alcohol in excess of the recommended limits was more marked in men (11.9%) compared with women (2.5%). For both genders, those in the younger age groups constituted a greater proportion of those with excessive alcohol intake. Smokers also showed high alcohol intake, particularly in men (25 versus 9% for smokers versus non-smokers). Lower grades in men (16%) had a greater intake of alcohol compared with higher grades (11%). There was little alcohol–job grade difference in women.

Poor aerobic capacity rose with increasing age, with no gender difference. Job grade did not seem to be associated with a difference in aerobic capacity. Female non-smokers were associated with a higher proportion of those with poor aerobic capacity (18 versus 13%), whilst more men who smoked were in the poor aerobic capacity group compared with men who did not smoke (19 versus 16%).

Table 3 shows the main statistically significant associations between at-risk parameters and a range of denominators. Males showed a predominance for drinking alcohol to excessive levels (OR = 5.19, 95% CI = 3.49, 7.72), hypertension (OR = 2.60, 95% CI = 1.69, 3.99) and raised serum cholesterol levels (OR = 2.48, 95% CI = 1.98, 3.10) compared with females. Women were much more likely to be obese than men (OR = 7.79, 95% CI = 6.20, 9.77), and they had relatively poorer pre-programme physical activity levels (OR = 1.77, 95% CI = 1.51, 2.08). Low job grade was associated with

obesity (OR = 1.61, 95% CI = 1.33, 1.95), whilst raised cholesterol and hypertension (OR = 1.78, 95% CI = 1.14, 2.80) were more prevalent in the high grade category (OR = 1.69, 95% CI = 1.34, 2.14). Older participants (>35 years) were approximately twice as likely to be obese (OR = 2.07, 95% CI = 1.52, 2.84), have raised cholesterol (OR = 2.58, 95% CI = 1.76, 3.78) and achieve poor aerobic capacity (OR = 2.00, 95% CI = 1.40, 2.86) compared with younger colleagues. Those aged >35 years were almost five times more likely to be in the at-risk hypertensive group (OR = 4.98, 95% CI = 1.82, 13.57). Smokers were more likely to be obese (OR = 1.54, 95% CI = 1.17, 2.03), have poorer aerobic capacity in those aged under 35 years (OR = 2.11, 95% CI = 1.04, 4.30) and drink excessively (OR = 2.97, 95% CI = 2.17, 4.07). A history of poor physical activity level before the programme was associated with obesity (OR = 1.76, 95% CI = 1.44, 2.15) and, not surprisingly, poor aerobic capacity (OR = 3.01, 95% CI = 2.35, 3.86) in the programme assessment.

Follow-up survey

There were 2139 employees invited to participate in the 6 month follow-up postal questionnaire survey, of whom 1393 responded (65%). Non-responders were not followed up. The group comprised 794 males (57%) and 599 females (43%), with the majority >35 years (1242, or 89%). From this, 1158 (83%) respondents had been identified in the original programme as needing to make

Table 3. At-risk parameters and statistically significant associations with a range of categories

<i>At-risk parameter</i>	<i>At-risk category</i>	<i>OR</i>	<i>95% CI</i>	<i>P-value</i> ^a
Obesity	Females	7.79	6.20, 9.77	<0.001
	Low grade job	1.61	1.33, 1.95	<0.001
	Age 35+	2.07	1.52, 2.84	<0.001
	Smoker	1.54	1.17, 2.03	<0.01
	Below average previous exercise	1.76	1.44, 2.15	<0.001
Hypertension	Males	2.6	1.69, 3.99	<0.001
	High job grade	1.78	1.14, 2.80	<0.05
	Age 35+	4.98	1.82, 13.57	<0.001
Cholesterolaemia	Males	2.48	1.98, 3.10	<0.001
	High job grade	1.69	1.34, 2.14	<0.001
	Age 35+	2.58	1.76, 3.78	<0.001
Poor aerobic capacity	Age 35+	2.00	1.40, 2.86	<0.001
	Smoker (<35)	2.11	1.04, 4.30	<0.05
	Below average previous exercise	3.01	2.35, 3.86	<0.001
Acohol excess	Males	5.19	3.49, 7.72	<0.001
	Smoker	2.97	2.17, 4.07	<0.001
Poor exercise history	Females	1.77	1.51, 2.08	<0.001

^aPearson's χ^2 test.

one or more lifestyle changes. This lifestyle-change group had the same gender and age profile as the overall respondent group.

Table 4 shows the response of follow-up participants across five key healthy lifestyle areas. It should be emphasized that more than one area may be represented in the same individual. Smoking represented the change that was most difficult to attempt (45% did not attempt) and had the highest failure rate (41%). After smoking, the next highest failure rates were weight reduction (37%), diet improvement (30%), increased exercise (26%) and reduced alcohol consumption (22%). Smoking abstinence showed the lowest overall success rate at 6 months (14%). The lifestyle behaviour that had the greatest success rate was that of diet improvement (64%), followed by increased exercise (62%), reduced alcohol consumption (54%) and weight reduction (52%).

The overall rate of non-attempted change based on an average across each of the five lifestyle areas was one in five (19.6%); tried but failed represented almost one in three (31.2%); and successful maintenance after 6 months occurred in nearly one-half (49.2%).

Discussion

This study set out to evaluate the characteristics of those participating in a workplace health promotion programme and the degree to which their healthy lifestyle behaviours changed following attendance. The LPAA met the success criteria proposed in a recent systematic review of workplace health promotion interventions [19], i.e. a bespoke employee-participative intervention focusing on a range of defined and modifiable risk factors, the provision of which had top management support. Additionally, programme evaluation was inbuilt in the form of a follow-up survey in which healthy lifestyle behaviour change was used as an outcome measure and pre-intervention data were recorded, both of which were also commended as good practice in the systematic review study.

The prevalence of physical inactivity (60%) found prior to the assessment was slightly higher than the 40–50% reported in two similar UK workplace studies [14,26]. Inactivity was, however, lower than that found in an NI physical activity survey [27] of >1000 men and women, where almost 80% had physical activity levels below that likely to confer any cardioprotective benefit. This population-based survey also found that the general level of inactivity was greater in NI compared with a similar survey carried out in England [28]. The regional difference in general physical activity levels may explain the higher prevalence of inactivity found in the NI workforce participants compared with their Great Britain counterparts. The finding that inactivity in a workplace group is less than that in the reference general population could

Table 4. Positive healthy lifestyle behaviour changes at 6 month follow-up ($n = 1158$)

<i>Healthy lifestyle behaviour</i>	<i>No. 'at risk' at initial test</i>	<i>No. not attempting change (%)</i>	<i>No. tried and failed after the test (%)</i>	<i>No. maintaining change after the test (%)</i>
Diet	744	45 (6)	221 (30)	478 (64)
Exercise	1007	119 (12)	262 (26)	626 (62)
Weight	715	76 (11)	265 (37)	374 (52)
Alcohol	174	42 (24)	38 (22)	94 (54)
Smoking	205	92 (45)	85 (41)	28 (14)

be a feature of the self-selection bias of participants volunteering to be part of a programme assessment in addition to the healthy worker effect (where an individual in employment tends to be relatively more healthy and active) [29,30].

The female predominance for low physical activity levels found in this study has also been reported in other occupational [14] and population surveys [27,31]. This difference may be evident from childhood, where fewer females participate in sport at school, and in the workplace context, where they are more challenged compared with men, in balancing work and socio-domestic responsibilities with less opportunity for engaging in physical activity. There may be an association between obesity and poor physical activity history in females—are females more obese because of poor dietary selection, inactivity or both?

Inactivity is an important health determinant both for the general population and for workforces. The relationship between inactivity and poor health has been established [28], with those who are most active having the lowest coronary risk score and a lower prevalence of health problems [27]. This study did not find the job grade differential in pre-programme activity levels observed in other studies, where those in lower grades and with primary education had higher levels of inactivity compared with those in higher grades and with tertiary education [14,27,31]. It could be argued that job grade in itself may be a poor predictor of overall physical activity in any case given that those employed in physically active tasks (predominately low job grade) may be more likely not to engage in exercise outside the workplace, whilst those most sedentary at work (high job grade) might compensate for this inactivity by being more active outside of work.

Alcohol consumption above recommended national limits was found to be substantially less than that reported in the NI population survey for men (50% less) and women (70% less), although it was consistent with the population profile, more males than females were drink-

ing excessively [27]. A large number of the participants from this mostly sedentary workforce were overweight, with more females than males in the obese category. This was consistent with general population prevalence, where in NI ~60% of the adult population is overweight, with the degree of obesity increasing with age, being most pronounced after the age of 35, particularly in women [27].

Smoking and its impact on health is a major determinant of ill-health in NI [5]. The prevalence of smoking (17%) in LPAA participants was lower than that reported for the general population in NI (31%) [27], in a pan-European survey [31] (EU average 36%, UK 34% and Ireland 31%) and in two workplace surveys [14,26] (which had an average of 27%). This finding might suggest that participant self-selection tended to produce a greater proportion with better healthy lifestyle behaviours and hence fewer smokers prepared to volunteer. Evidence for this can be found in a US study where those joining a workplace fitness centre tended to be more active and expressed greater commitment to health promotion beliefs and behaviours compared with non-joiners [32]. Such differences in attitudes and behaviours (combined with those of gender, age and job grade) highlight the need for caution when generalizing the results of a voluntary participative programme to the workforce as a whole.

The overall prevalence of raised serum cholesterol was lower than that in the general population. Men were predominant in the elevated cholesterol group in the workplace, in contrast to the community pattern, where women were predominant [27]. It could be anticipated that those in employment would have greater awareness and easier means to access better diets than those who are unemployed. Whether such an opportunity is taken is another matter. A small number of participants had raised blood pressure (4%), which was higher than that of the general population prevalence (2.5%) [33] and similar to that in other workforce surveys (5%) [34].

This study confirmed that poor aerobic capacity is a feature of increasing age and poor physical activity history. The latter association could be seen to provide validation to the LPAA exercise test as it shows a relationship between poor fitness (self-reported inactivity) and aerobic capacity (measured level of fitness). Whilst smoking was associated with excess alcohol intake and obesity, it was only of significance in measured aerobic capacity for those in the younger age group. The finding that young smokers are less fit than non-smoking colleagues in the same age group has implications for their future health, especially when the effects of increasing age are experienced. These ageing effects have been shown in this study to be: an increased likelihood of being overweight; having raised serum cholesterol; having a greater risk of hypertension; and achieving a poor aerobic capacity on testing. In other words, they are features of a sedentary

lifestyle, which itself is related to increasing age and associated degenerative changes in the cardiovascular system. This confirms the importance of achieving the best possible healthy lifestyle behaviours, including physical activity levels, when young and carrying the benefits forward to be better able to withstand the natural process of decline which occurs into middle age and beyond.

Given that this study has identified areas where healthy choices need to be made, how successful was the LPAA in contributing to any change in behaviour? A questionnaire method was used to evaluate the impact 6 months after the LPAA intervention. Concerns have been raised about using this approach owing to possible reporting bias in respondents who give answers that they feel are being sought [14]. On the other hand, the questionnaire encouraged participation by being easy to complete, and it has been suggested by researchers that self-completed questionnaires are an effective and economical use of time and effort [35].

Whilst acknowledging that one-third of those invited to participate in the follow-up survey did not do so, there was nevertheless, considering the nature of the LPAA (a single brief intervention), a high level (80%) of overall attempted healthy lifestyle change in the immediate post-programme period. At the end of the follow-up period, the successful maintenance average for a range of lifestyle behaviours was in the region of 50%, very similar to that found in a health check and behaviour change study [14] of Glasgow factory workers. Perhaps not surprisingly, quitting smoking was the most difficult change to attempt and had the highest failure rate. Nevertheless, the rate of abstinence (14%) compares favourably with a similar workplace intervention [14] where only 7% of attenders at a health check had quit after 6 months. In fact, the success rate is close to that found in a study (15%) of the efficacy of nicotine replacement therapy as an aid to stopping smoking [36]. When these levels of quitting are compared with the 39% found in an NHS smoking clinic [37] at 4 weeks, it seems reasonable to assume that, for many, smoking tends to be resumed after time, with long-term maintenance being difficult to achieve. Further health promotion initiatives to target smokers seem justified given that over half of the smokers attempted to quit and had clearly moved beyond the pre-contemplation stage that is seen as an important indicator of potential cessation success [38].

Apart from smoking, the other main lifestyle change areas had good levels of behaviour modification, with the greatest success seen in dietary change (64%), followed by increased physical activity (62%), sensible alcohol consumption (54%) and weight reduction (52%). This level of success would indicate the positive benefit of an LPAA-type intervention. To improve success, the OXCHECK study group [39] suggested using more targeted approaches to modify those behaviours with high

failure rates, such as smoking. The participants who could be further targeted are those who reported attempting to make changes but failing to maintain them. A variety of reasons were given for such failure, the most common being lack of willpower, family commitments and social pressures. The perceived cost to the individual and the enjoyment of poor lifestyle activities have also been cited [40]. One method of enhancing the impact of a healthy lifestyle intervention in changing attitude has been the provision of healthy living literature similar to that used in this LPAA [41]. In addition to receiving standard general health promotion literature, participants were also given a printed personalized analysis of their performance with suggestions on how to make positive changes in those lifestyle areas requiring improvement. This is a major strength of the computer-based LPAA approach.

Maintenance of change in the longer term is undoubtedly an issue [42,43]. Health checks can help promote healthier lifestyles from which longer term and other health benefits may accrue [44], with a decrease in disease risk and improvement in physiological findings [42,45]. The LPAA in this study has been well received by both employing departments/agencies and in particular by participants, who consistently give very high satisfaction ratings. Owing to the computerized nature of the LPAA, it is feasible to re-assess individuals and provide comparisons with previous performance. It would seem reasonable to postulate that re-assessment (e.g. at 2–3 year intervals) is likely to impact positively on the maintenance of lifestyle change.

Health checks such as the LPAA can form an important part of a health promotion strategy in the workplace. They should not be regarded as 'one off' initiatives, but, rather, be part of an ongoing and integrated employee well-being policy to which management and employers are fully committed. Much needs to be done to introduce and shape workplace health promotion so that it can be seen to improve health behaviours in employees in the longer term for the benefit of the individual and the organizations for whom they work. The NICS continues to be committed to the LPAA programme, which will have reached 5000 participants by the end of September 2001.

Conclusion

An LPAA programme such as the one in this study uses the workplace to promote health and well-being amongst employees, and aims to create a culture within the organization that promotes health and well-being alongside good health and safety practice. By offering employees the opportunity to assess their fitness and lifestyles, it is hoped that they will be empowered to make informed healthy choices not just for themselves, but also for their

friends and families, thereby extending the potential benefits beyond the worksite.

These programmes can be seen as successful practical workplace health promotion tools that encourage people to make sustainable lifestyle behaviour changes. Such an approach is commended to other employers who want to have a healthy workforce, with all the ensuing benefits for the individual, the organization and public health in general. That said, more evaluation is required to establish the real impact on long-term behaviour, as well as the link between improved health and well-being and good performance and achievements at work. This is an area worthy of further investigation and perhaps the real challenge for advocates of workplace health promotion programmes lies in establishing a sustainable improved health–performance relationship.

References

1. Addley K. Developing programmes to achieve a healthy society: creating healthy workplaces in Northern Ireland. *Occup Med* 1999; **49**: 325–330.
2. NI Department of Health and Social Services. *Well Into 2000—A Positive Agenda for Health and Well-being*. Belfast: NI Department of Health and Social Services, 1997.
3. NI Department of Health and Social Services. *Health and Well-being: Into the Next Millennium. Regional Strategy for Health and Social Well-being 1997–2002*. Belfast: NI Department of Health and Social Services, 1996.
4. Northern Ireland Executive. *Investing for Health*. Belfast: Northern Ireland Executive, 2000.
5. NI Department of Health and Social Services. *The Health of the Public in Northern Ireland: Annual Report of the Chief Medical Officer 1996*. Belfast: NI Department of Health and Social Services, 1997.
6. World Health Organization. *Ottawa Charter for Health Promotion*. Geneva: World Health Organization, 1986.
7. World Health Organization. *Constitution*. Geneva: World Health Organization, 1948.
8. Health Promotion Agency for Northern Ireland. *Health Promotion at Work in Northern Ireland*. Belfast: Health Promotion Agency for Northern Ireland, 1995.
9. Confederation of British Industry. *Missing Out—1998 Absence and Labour Turnover Survey*. London: Confederation of British Industry, 1998.
10. Health & Safety Executive. *Self-reported Work-related Illness in 1995: Results from a Household Survey*. Sheffield: Health & Safety Executive, 1998.
11. Confederation of British Industry. *Managing Absence—In Sickness and in Health*. London: Confederation of British Industry, 1997.
12. Wynne R, Clarkin N. *Under Construction—Building for Health in the EC Workplace*. Luxembourg: European Foundation for the Improvement of Living and Working Conditions, 1992.
13. Gamble RP, Boreham CAG, Stevens AB. Effects of a 10 week exercise intervention programme on exercise and

- work capacities in Belfast's ambulancemen. *Occup Med* 1993; **43**: 85–89.
14. Hanlon P, Carey L, Tannahill C, *et al.* Behaviour change following a workplace health check: how much change occurs and who changes? *Health Promot Int* 1998; **13**: 131–139.
 15. Kelly MP, Carey L, Hanlon P, *et al.* Do health checks cause stress? *Occup Med* 1999; **49**: 319–323.
 16. O'Leary L. Fitness at work—is it worth it? *Occup Health Rev* 1994; **46**: 14–16.
 17. Paffenbarger RS, Wing AL, Hyde RT. Physical activity as an index of heart attack risk in college alumni. *Am J Epidemiol* 1978; **108**: 161–175.
 18. Murphy MH, Hardman AE. Training effects of short and long bouts of brisk walking in sedentary women. *Med Sci Sports Exerc* 1998; **30**: 152–157.
 19. Harden A, Peersman G, Oliver S, Mauthner M, Oakley A. A systematic review of the effectiveness of health promotion interventions in the workplace. *Occup Med* 1999; **49**: 540–548.
 20. Fitech Ltd. *Fitech Counsellor Series*. London: Fitech Ltd, 1998.
 21. NI Department of Health and Social Services. *Reducing Alcohol Related Harm in Northern Ireland. A Report to the DHSS: Well into 2000*. Belfast: NI Department of Health and Social Services, 1999.
 22. Ramsey LE. British Hypertension Society guidelines for hypertension management. *Br Med J* 1999; **319**: 630–634.
 23. NI Department of Health and Social Services. *CREST: Prevention of Coronary Disease—European Guidelines*. Belfast: NI Department of Health and Social Services, 1997.
 24. Astrand I, Jonnson BG. Work capacity in men and women aged 18 to 65. *Scand J Soc Med* 1979; **7**: 131–142.
 25. Uitenbroek DG. *SISA—Binomial*. Hilversum, 1997. <http://home.clara.net/sisa/binomial.htm>
 26. Chatterjee DS. A multicentre health promotion programme for coronary heart disease. *Occup Health* 1997; **49**: 12–15.
 27. MacAuley D, McCrum EE, Stott G, *et al.* *The Northern Ireland Health and Activity Survey*. London: HMSO, 1994.
 28. The Sports Council and the Health Education Authority. *Allied Dunbar National Fitness Survey: A Report of Activity Patterns and Fitness Levels*. London: The Sports Council and the Health Education Authority, 1992.
 29. McMichael AJ, Spirtas R, Kupper LL. An epidemiologic study of mortality within a cohort of rubber workers, 1964–72. *J Occup Med* 1974; **16**: 458–464.
 30. Chen R, Seaton A. The influence of study characteristics on the healthy worker effect: a multiple regression analysis. *Occup Med* 1996; **46**: 345–350.
 31. Institute of European Food Studies. *A Pan-EU Survey on Consumer Attitudes to Physical Activity, Body-weight and Health*. Luxembourg: European Commission, 1999.
 32. Eakin JM, Gotay CC, Rademaker AW, Cowell JWF. Factors associated with enrollment in an employee fitness center. *J Occup Med* 1988; **30**: 633–637.
 33. Office of Population Censuses and Surveys (OPCS). *The Dietary and Nutritional Survey of British Adults*. London: HMSO, 1991.
 34. Erfurt JC, Holtyn, K. Health promotion in small business: what works and what doesn't work. *J Occup Med* 1991; **33**: 66–73.
 35. Robson C. *Real World Research: A Resource for Social Scientists and Practitioner-researchers*. Oxford: Blackwell, 1993.
 36. Tang JL, Law M, Wald N. How effective is nicotine replacement therapy in helping people to stop smoking? *Br Med J* 1994; **308**: 21–26.
 37. Department of Health. *Statistics on Smoking Cessation Services in Health Action Zones in England, 1999 to March 2000*. London: Department of Health, 2000.
 38. Naidoo J, Willis J. *Practising Health Promotion: Dilemmas and Challenges*. London: Baillière Tindall, 1998; 144–145.
 39. Imperial Cancer Research Fund OXCHECK Study Group. Effectiveness of health checks conducted by nurses in primary care: final results of the OXCHECK study. *Br Med J* 1995; **310**: 1099–1104.
 40. Dawson J. Health and lifestyle surveys: beyond health status indicators. *Health Educ J* 1994; **53**: 300–333.
 41. Vasse R, Nijhuis F, Kok G. Effectiveness of a personalised health profile for blue collar workers. *J Environ Med* 1998; **40**: 69–75.
 42. Furuki K, Sumihisa H, Doosub J, Masayuki I, Toshiteru O. The effects of health promotion programs on body mass index. *J Occup Health* 1999; **41**: 19–26.
 43. Talvi AI, Jarvisalo JO, Knuts LR. A health promotion programme for oil refinery employees: changes of health promotion needs observed at three years. *Occup Med* 1999; **49**: 93–101.
 44. Hanlon P, McEwen J, Carey L, *et al.* Health checks and coronary risk: further evidence from a randomised controlled trial. *Br Med J* 1995; **311**: 1609–1613.
 45. Fukahori M, Hiroshi A, Isaso S, Toshiko I, Hideki O. Program of exercise training as a total health promotion plan and its evaluation. *J Occup Health* 1999; **41**: 76–82.