Effects of a Dutch Work-Site Wellness–Health Program: The Brabantia Project

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ABSTRACT

Objectives. This study examined a project designed to improve the health and wellness of employees of Brabantia, a Dutch manufacturer of household goods, by means of lifestyle changes and changes in working conditions.

Methods. The workers at one Brabantia site constituted the experimental group, and the workers from two other sites formed the control group. Biomedical variables, lifestyles, general stress reactions, and quality of work were measured identically in both groups at baseline and 1, 2, and 3 years later. During this period, there was continuous registration of absenteeism.

Results. The interventions brought about favorable short-term changes in terms of health risks, and there were stable effects on working conditions (especially decision latitude) and absenteeism.

Conclusions. A combination of interventions directed at both lifestyles and the work environment can produce extensive and stable effects on health-related variables, wellness, and absenteeism. (*Am J Public Health.* 1998;88: 1037–1041)

Introduction

The "Healthier Work at Brabantia" project, named after a Dutch manufacturer of household goods, was inspired by American work-site wellness health projects.[1,2] The philosophy underlying the project, however, differs from that of the typical American project.

American programs focus almost exclusively on changes in lifestyle.[1] In the Brabantia project, it was assumed that, above all, an improved working environment will enhance wellness and health. This basic philosophy is expressed in the Dutch working conditions law, which defines wellness at the work site in terms of explicit wellness conditions.[3] The demand–control–social support model[4] was used as a cornerstone for the formulation of these conditions. As a means of operationalizing the text of the law, 7 operational wellness conditions were defined[5]: completeness of the function, challenge, involvement in organizational tasks, autonomy, social contacts, cycle length, and information.

Each of these conditions gives rise to a fundamental issue. For example, in terms of completeness of the function, what are the proportions of time spent on the performance, preparatory, and supportive tasks entailed in a specific job? In this context, performance tasks are tasks that involve the mere execution of actions (e.g., the actions necessary to assemble a specific product), preparatory tasks are tasks that precede performance tasks (e.g., obtaining the necessary raw material from the stock or collecting and preparing the necessary tools), and supportive tasks are tasks that support performance tasks (e.g., maintenance of tools and machines or quality control of the product). If a job consists of more than 95% performance tasks, this is considered to constitute a wellness risk.

Other issues are as follows: (1) Is the function/task suited to the individual's capacities, or is it too difficult or too easy for the worker? (2) To what degree is the employee participating in the organization of his or her work? (3) Does the employee have enough autonomy concerning work rhythm, method, and sequence? (4) Can the employee establish and maintain a sufficient number of social contacts at the work site? (5) Does the job involve a sufficient number of tasks with cycles that are longer than 90 seconds? and (6) Does the employee have enough information concerning the objectives and outcome of the work? As additional wellness risks, lack of decision latitude (i.e., when problems occur) and ergonomic problems were considered.

Inspired by the Dutch working conditions law, the project is concerned with the following question: Do combined interventions, directed at both lifestyle and the content and organization of work, lead to (1) improved health behavior, (2) a reduction in health risks, (3) a reduction in general stress reactions, (4) improved quality of work, and (5) a reduction in absenteeism?

Methods

A quasi-experimental pretest/posttest control group design with repeated measures was used to evaluate the effects of the interventions. Workers from 3 Dutch Brabantia sites participated in the study. Employees at 1 site constituted the experimental group, and employees at the other 2 sites formed the control group. The experimental site and the larger control site were chosen at random; it was determined that the third site would be

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part of the control group because of its much smaller size. The sites were highly comparable, producing similar or identical household goods. The pretest was administered to both groups in 1990 and the posttests 1, 2, and 3 years later. The control group received no interventions. Participation in the study was on a voluntary basis. Data from each individual were known to the researchers but were not available to the company.

Subjects

The total eligible population consisted of 552 individuals. The research population, defined as the individuals for whom usable data were available from all measurements, consisted of 264 respondents (134 in the experimental group and 130 in the control group).

Measurement Instruments

The measurement protocol was identical for all measurement points and included (1) a structured interview completed during work time (30 to 45 minutes in duration), (2) self-report questionnaires to be completed at home (approximately 45 minutes), and (3) biomedical measurements (approximately 15 minutes) taken during working hours. At the last point of measurement, no biomedical measures were taken because of the financial costs that would have been incurred.

Interview. A structured interview was used to collect sociodemographic data, data on health behavior, and data on quality of work. The interview on health behaviors, based on the protocol for the World Health Organization Monica Gent Charleroi study,[6] consisted of questions on smoking, alcohol consumption, use of medicines, quality of sleep, physical exercise, and nutrition.

The data on quality of work were collected by means of the structured Wellness at Work interview.[7,8] By means of this structured interview, several wellness conditions were measured: completeness (score range: 0 to 2), challenge (0 to 3), involvement in organizational tasks (0 to 4), autonomy (0 to 8), social contacts (0 to 4), cycle length (100 to 500), and information (0 to 2). In addition, questions were asked on decision latitude (score range: 0 to 26) and ergonomic job aspects (0 to 13).

Biomedical measurements. After the interview, biomedical measurements were taken: heart rate, diastolic and systolic blood pressure (measured twice by means of an Erkameter-type sphygmomanometer), body weight and height (to calculate body mass index), and a blood sample to determine serum cholesterol level. No fasting instructions were given.

All employees were individually informed about the results of these measurements. If the results exceeded risk levels, the person was referred to the general practitioner. The following criteria for "high risk" were used: (1) serum cholesterol level of 6.5 mmol/L or 250 mg/L or higher, (2) diastolic blood pressure level of 105 mm Hg or higher and/or systolic blood pressure level of 160 mm Hg or higher, (3) body mass index of 30 or higher, and (4) smoking habit (1 cigarette or more per day).

Questionnaires. A set of self-report questionnaires was used to assess stress reactions and social support. Employees completed 5 subscales of the validated Dutch version of the Symptom Checklist-90 anxiety: (score range: 10 to 50), depression (16 to 80), somatic complaints (12 to 60), hostility (6 to 30), and sleep problems (3 to 15). They also completed 2 subscales measuring social support (from colleagues and from supervisors) from a validated, shortened Dutch version[10] of the Workstress Questionnaire.[11]

Registration. Employee absenteeism was continuously monitored at all company sites according to a standardized registration system (EMPLOS).

Construction of Effect Variables

To evaluate the effects of the interventions, we constructed several outcome variables.

Lifestyles. A total lifestyle score (range: 0 [no healthy lifestyles] to 6) was calculated on the basis of 6 variables: smoking, amount of physical exercise, hours of sleep, body mass index, use of alcohol, and fat consumption.

Health risk. A probability score (0 [no risk] to 1) was calculated on the basis of the following variables: age, serum cholesterol, systolic blood pressure, and smoking habit. The coefficients from the Framingham Study[12] were used in calculating this score. The probability value represents a subject's risk of developing coronary heart disease during the subsequent 8 years.

General stress reactions. A total score was calculated on the basis of scores on the 5 Symptom Checklist-90 subscales described earlier. High scores indicated that many general stress reactions were reported.

Working conditions. By means of a principal components analysis, the conditions measured by the structured Wellness at Work interview were reduced to 3 dimensions or scales. These dimensions, which could be interpreted as "control," "ergonomic conditions," and "psychological demands," explained, respectively, 20%, 10%, and 7% of the variance. The psychological demands scale included 5 items (e.g., "Does your work require a lot of mental concentration?" and "Is your work too easy [or too complex]?"), the control scale consisted of 10 items (e.g., "Can you correct your own mistakes?" and "Can you determine the way in which you perform a given task?"), and the ergonomic conditions scale contained 10 items (e.g., "Do you have the right means [tools, machines] to perform your work?" and "Do you have sufficient light to do your work properly?"). A social support factor was constructed on the basis of the 2 subscales from the Dutch version of the Workstress Questionnaire (lack of social support from colleagues and from supervisor). This made it possible to use the dimensions of the demand–control–social support model[4] to evaluate the effects on working conditions.

Absenteeism. The percentage of absenteeism was calculated every half year on the basis of the following formula: [number of days absent in half-year period/hr (mean number of personnel × possible workdays during the period)] × 100.

Statistical Analyses

Chi-square analyses and *t* tests were used to assess differences at pretest between the experimental and control groups. As a means of assessing the effects of the interventions, repeated measures analyses of covariance (ANCOVAs) were carried out; in these analyses, pretest scores, educational level, gender (for all variables), and age (for health behaviors and health risks) were covariates. Additional ANCOVAs were used to determine effects at specific measurement points. Furthermore, when significant effects over time were found on global scores, additional ANCOVAs were performed on the components of the effect variables.

The Interventions

The Brabantia project was based on intervention principles that have been described elsewhere.[8,13] The project began in 1990. During the first year of intervention, activities were targeted at lifestyles. The interventions directed at quality of work were implemented during the second and third years because they required a longer period of preparation.

At the individual level, all employees had the opportunity to participate in a half-hour intervention session (held during lunchtime at the work site) 3 times a week. Half of the time spent in each session was considered (paid) work time, while the other

half was considered to be part of the employees' free (lunch) time. The sessions consisted primarily of physical exercise; during the first year of the intervention, however, 1 session of each 6 was devoted to health education. The topics of these sessions were nutrition (7 sessions), alcohol and drug consumption (2 sessions), working conditions and stress, smoking behavior, headaches, and back pain (1 session each). In addition to the relevant information, participants in these health education sessions were given the opportunity to join groups oriented around smoking, head aches, or back pain.

The content of the physical exercise sessions was chosen by the participants on the basis of video recordings of various types of physical exercise. The health education sessions were discontinued after the first year of intervention because of low participation (10%–20% of the eligible population). In the second year, the initiative for interventions directed at lifestyles was transferred to a special lifestyle committee (a group of workers elected by employees). This resulted in fewer but more comprehensive activities, such as a health fair in the second year and a health exhibition in the third year, with high levels of participation (60%–70% of the eligible population).

A second type of intervention at this level consisted of about 40 hours of training in social skills and leadership, along with training on how to lead work consultation meetings for upper and middle management.

At the organizational and environmental level, an intervention was introduced that gave support to the interventions at the individual level. The measures included, for example, creation of on-site exercise facilities; a smoking policy in the cafeteria; advertising of the program by means of an information corner in the cafeteria, along with posters, videos, internal radio messages, and newsletter articles; and providing of healthy food (and information about nutrition) in the cafeteria. In addition, incentives to promote participation in the program were used (e.g., T-shirts, sweatshirts, sport bags, and the chance to win a weekend stay at a health and leisure resort).

The second type of intervention at the organizational and environmental level was based on screening for wellness risks at work by means of the structured Wellness at Work interviews with each employee. The resulting information was used to construct wellness risk profiles for each function category and each of the 11 production units. These profiles were examined by a "wellness committee" consisting of the management team and members of the project team. On the basis of this information, the committee developed proposals for modifying specific functions and/or aspects of the work organization and environment. After extensive consultation with the participating workers, the wellness committee guided the implementation and evaluation of the proposed changes.

For example, production of the Brabantia potato-chipper had previously been divided into short-cycled tasks. The work was simple, and each worker had always performed the same repetitive task. Decision latitude was almost nonexistent. Opportunities for the workers to influence the rate and sequence of work and/or the planning of production were few. Workers had been well informed about immediate but not about more distant outcomes of their work. In addition, opportunities for social contacts between the workers were limited, partly because of the way in which work areas were designed.

A "task group" of workers was established and given authority over the entire production process, from collection of raw materials to delivery of the product to the sales department. This implied additional tasks such as initiating work orders, arranging supply and transport of raw materials and finished products, calculating hours spent on tasks, and performing quality checks. In addition to a greater variety of tasks, rotation of tasks became possible. Workers could take turns in the transport and wrapping of finished products or any other constituent activity. For such changes in working conditions, additional training was necessary for both leaders and the other employees. In addition, a reorganization of the production line was necessary to support these changes and to improve ergonomic conditions.

Thus, the entire organizational structure at the experimental site was changed from a product-oriented structure to a more functional one. For example, there were 26 foremen and 6 transporters before the intervention, while at the end there were only 13 foremen and no transporters, since many of the tasks were now carried out by the production workers themselves. Another consequence was that the evaluation and gratification system changed from one based on individual performance to a combined individual and group evaluation system.

Results

Participation and Dropout

At pretest, 346 people participated in the measurements. Respondents differed from nonrespondents on gender but not age. Men participated significantly more than women (56.5% vs 46.3%; $\chi^2=4.99$, $P=.026$).

The number of experimental group respondents decreased from 175 at pretest to 167, 157, and 134 at posttests 1, 2, and 3, respectively; the number of control group respondents decreased from 171 to 169, 157, and 130, respectively. At all points of measurement, there were no significant differences in demographic characteristics between the 2 groups other than the differences already existing at pretest.

The experimental group did not differ from the dropouts on any of the demographic characteristics, work status variables, or dependent variables. The control group differed from the dropouts on gender as well as on control/decision latitude. More women dropped out, and dropouts had lower levels of control than those who remained.

Pretest Differences

Chi-square analyses and *t* tests were used in comparing the experimental group and the control group on sociodemographic characteristics. No significant differences were found for age ($t_{262}=1.74$, $P=.08$) or marital status ($\chi^2_2=1.22$, $P=.54$). The mean age for the experimental group was 38.6 years (SD = 10.48), and 81.3% were married; in the control group, the mean age was 40.9 years (SD = 10.44), and 82.3% were married. There were, however, significant differences between the experimental and control group, in terms of gender and educational level. In the experimental group, 26.1% of the population was female, as compared with only 12.2% in the control group ($\chi^2_1=8.24$, $P\leq.01$). The percentage of employees with only an elementary school education was also higher in the experimental group than in the control group (61.2% vs 49.2%; $\chi^2_2=10.96$, $P\leq.01$). For this reason, gender and educational level were entered as covariates in all effect analyses.

At the pretest, the experimental group differed from the control group on 3 of the dependent variables: psychological demands, control, and ergonomic conditions. Employees in the experimental group reported fewer psychological demands ($t_{262}=-3.45$, $P\leq.01$) and a lower level of control ($t_{262}=-2.55$, $P\leq.01$) than employees in the control group. In addition, the ergonomic conditions of the experimental group were not as good as those of the control group ($t_{262}=-3.14$, $P\leq.01$). There were no other significant differences between the experimental and control groups at pretest.

Program Effects

Effects on lifestyles. No statistically significant effects over time were found on

TABLE 1—Means and Adjusted Means of Outcome Measures for Experimental and Control Groups: The Brabantia Project, the Netherlands, 19901993

Outcome Variable and Measurement	Experimental Group			Control Group		
	Mean (SD)	Adjusted Mean	n	Mean (SD)	Adjusted Mean	n
No. of healthy lifestyles						
Pretest	4.44 (1.212)		133	4.43 (1.199)		129
Posttest 1	4.45 (1.192)	4.43		4.38 (1.175)	4.39	
Posttest 2	4.54 (1.156)	4.53		4.38 (1.249)	4.38	
Posttest 3	4.59 (1.084)	4.59		4.26 (1.321)	4.25	
Health risk						
Pretest	0.050 (.057)		117	0.055 (.060)		120
Posttest 1	0.048 (.051)	0.051		0.062 (.065)	0.059	
Posttest 2	0.058 (.062)	0.062		0.065 (.063)	0.061	
General stress reactions						
Pretest	0.10 (.099)		113	0.10 (.094)		113
Posttest 1	0.10 (.105)	0.10		0.10 (.097)	0.10	
Posttest 2	0.09 (.100)	0.08		0.08 (.074)	0.08	
Posttest 3	0.09 (.108)	0.09		0.10 (.099)	0.10	
Psychological demands						
Pretest	1.51 (.394)		133	1.70 (.517)		129
Posttest 1	1.55 (.474)	1.64		1.75 (.489)	1.67	
Posttest 2	1.49 (.377)	1.55		1.49 (.377)	1.66	
Posttest 3	1.53 (.426)	1.60		1.64 (.417)	1.57	
Control						
Pretest	2.32 (.441)		133	2.45 (.412)		129
Posttest 1	2.34 (.415)	2.40		2.50 (.359)	2.44	
Posttest 2	2.53 (.306)	2.57		2.54 (.355)	2.50	
Posttest 3	2.50 (.309)	2.54		2.53 (.368)	2.49	
Ergonomic conditions						
Pretest	2.41 (.329)		133	2.54 (.305)		129
Posttest 1	2.37 (.294)	2.41		2.49 (.270)	2.46	
Posttest 2	2.44 (.275)	2.48		2.50 (.301)	2.46	
Posttest 3	2.43 (.271)	2.46		2.54 (.262)	2.51	
Social support						
Pretest	3.15 (.418)		112	3.18 (.346)		114
Posttest 1	3.09 (.424)	3.09		3.14 (.365)	3.13	
Posttest 2	3.16 (.334)	3.16		3.18 (.381)	3.17	
Posttest 3	3.11 (.311)	3.12		3.13 (.379)	3.13	

lifestyle variables (see Tables 1 and 2) in analyses using pretest scores, age, gender, and educational level as covariates. Additional ANCOVAs did not reveal significant differences on any of the posttests.

Effects on cardiovascular health risk. When pretest scores, age, gender, and educational level were used as covariates on posttest scores, a statistically significant difference was found on health risk to the advantage of the experimental group. Additional ANCOVAs showed that this effect was mainly caused by a significant difference at the first posttest measurement in favor of the experimental group, a difference that could be attributed to a change in serum cholesterol levels in men (men: $F_{1,194}=5.61$, $P=.02$; women: $F_{1,42}=2.97$, $P=.09$).

Effects on general stress reactions. When pretest scores, gender, and educational level were used as covariates, no significant differences were found between the experimental and control groups. Additional ANCOVAs revealed no significant differences on any of the posttests.

Effects on working conditions. There was a significant difference between the experimental and control groups in perceived psychological demands over time. Further ANCOVAs indicated that this difference was mainly attributable to a significant change in perceived psychological demands between the second and third posttests ($F_{1,260}=10.15$, $P\leq.01$).

The change over time in perceived control was also significantly different for the 2 groups. Further ANCOVAs showed a large increase in control in the experimental group (relative to the control group) between the first and second posttests ($F_{1,260}=15.74$, $P\leq.01$).

There was also a trend for ergonomic conditions in the expected direction. Further ANCOVAs revealed a significant increase in ergonomic conditions in favor of the experimental group between the first and second posttests ($F_{1,260}=3.94$, $P\leq.05$).

The interventions did not lead to significant changes over time in terms of social support from supervisors and colleagues. Additional ANCOVAs on the separate posttests did not reveal significant effects.

Effects on absenteeism. A standardized registration system for absenteeism was introduced in the experimental and control groups in mid-1990, at the time of the pretest. Standardized data were obtained until the end of 1993. Before the intervention was initiated, the percentage of absenteeism in the experimental group was 15.8%, as compared with 14.3% in the control group. At the end of the program, absenteeism in the experimental group had decreased to 7.7% (vs 9.5% in the control group). Thus, there were decreases in absenteeism of 8.1% in the experimental group and 4.8% in the control group. In comparison with the national Dutch absenteeism percentages for workers in the light metal industries, the experimental group showed a clear reduction over this time period. In fact, the percentage of absenteeism in the experimental group was below the mean national percentage. In contrast, the trend in the control group followed the national trend and

Table 2—Results of Analyses Assessing Differences Between the Experimental and Control Groups

Outcome Variable and Measurement	F	P
Healthy lifestyle		
MANCOVA	1.86	.16
Pretest–P1	0.17	.68
P1–P2	0.54	.46
P2–P3	1.62	.20
Health risk		
MANCOVA	5.57	.02
Pretest–P1	6.36	.01
P1–P2	4.33	.04
General stress reactions		
MANCOVA	0.19	.83
Pretest–P1	0.36	.55
P1–P2	0.18	.67
P2–P3	0.41	.52
Psychological demands		
MANCOVA	4.22	.01
Pretest–P1	0.01	.92
P1–P2	0.62	.43
P2–P3	10.15	.01
Control		
MANCOVA	10.30	.01
Pretest–P1	0.40	.53
P1–P2	15.74	.01
P2–P3	0.13	.72
Ergonomic conditions		
MANCOVA	2.35	.10
Pretest–P1	0.04	.84
P1–P2	3.94	.05
P2–P3	2.49	.12
Social support		
MANCOVA	0.55	.58
Pretest–P1	0.12	.73
P1–P2	0.80	.37
P2–P3	0.00	1.00

Note. MANCOVA = multivariate analysis of covariance; P1 = posttest 1; P2 = posttest 2; P3 = posttest 3.

remained, on average, 2% to 3% higher than the national percentage.

Discussion

Interventions at the individual level directed at lifestyle changes, which were introduced during the first year of intervention, brought about a favorable change in health risk at the first posttest. This effect was mainly due to the significant decrease in cholesterol levels in the experimental group, which can be attributed to the fact that half of the health education sessions were devoted to nutrition education and to an accompanying cafeteria project in which a variety of healthy foods were added to the traditional foods offered in the cafeteria. The fact that the initial effect on health risk disappeared at posttest 2 illustrates that continuous and more extensive intervention is required to produce permanent and broader effects. Because the emphasis on lifestyles was much weaker in this study than in comparable American projects,[2] it may not come as a surprise that American programs generally have produced superior effects in terms of lifestyle and health-related variables.

General stress reactions (anxiety, depression, hostility, somatic complaints, and sleep problems) did not change over time in either the experimental or the control group and were thus unaffected by the interventions. One could argue, however, that changes in work-related stress reactions are more realistic targets of wellness–health promotion programs. The program did have favorable effects on work-related variables, including psychological demands, control, and ergonomic conditions. The significant improvement in perceived control over time in the experimental group can be considered a particularly important intervention effect, since a change in psychological demands does not guarantee beneficial wellness/health effects, while an increase in control or decision latitude usually does, in fact, result in such benefits.[4] Effects on ergonomic conditions may be spillover effects of the reorganization of work.

The results also show a reduction in absenteeism in the experimental group. This reduction was so substantial that, since the second year of intervention, the company has had a positive financial return on its investment in the project. While this undoubtedly represents a success, the absenteeism rate in the company was high to begin with. Unless large populations are involved, it will be difficult to obtain cost-effectiveness in companies with lower initial absenteeism rates.

In conclusion, this project emphasized the organization and content of work rather than lifestyles. Therefore, it is not surprising that the project had its strongest effects on perceived work conditions and absenteeism. American programs tend to score better on health-related variables and thus seem to influence outcomes such as absenteeism via a different pathway. The different philosophies at the base of these approaches may not facilitate reconciliation.[14] A combination of the 2 approaches may produce more permanent effects on a variety of wellness–health targets, especially in a population of blue-collar workers such as those employed at the Brabantia factory. □

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