

Job control mediates change
in a work reorganization intervention for stress reduction

Frank W. Bond and David Bunce
Goldsmiths College, University of London

Journal of Occupational Health Psychology (2001), vol. 6(4), 290 - 302

An earlier version of this article was presented at the “Second European Conference of the European Academy of Occupational Health Psychology”, in Nottingham, UK, in December 2000.

Correspondence concerning this article should be addressed to Frank W. Bond, Department of Psychology, City University, Northampton Square, London EC1V OHB, United Kingdom. Electronic mail may be sent to F.W.Bond@city.ac.uk.

Abstract

This longitudinal, quasi-experiment tested whether or not a work reorganization intervention can improve stress-related outcomes by increasing people's job control. To this end, the authors used a participative action research (PAR) intervention that had the goal of reorganizing work, so as to increase the extent to which people had discretion and choice in their work. Results indicated that the PAR intervention significantly improved people's mental health, sickness absence rates, and self-rated performance at a 1-year follow-up. Consistent with occupational health psychology theories, increase in job control served as the mechanism, or mediator, by which these improvements occurred. Discussion focuses on the need to understand the mechanisms by which work reorganization interventions affect change.

Job control mediates change
in a work reorganization intervention for stress reduction

For years, occupational health psychologists have advocated modifying aspects of the work environment that are associated with mental ill-health (e.g., Bunce & West, 1996; Ivancevich, Matteson, Freedman, & Phillips, 1990; Newman & Beehr, 1979; Murphy, 1984; Quick, Quick, Nelson, & Hurrell, 1997). These environmental risk factors arise from (unhelpful) ways in which work is organized. *Work organization* refers to the scheduling of work, job structure and design, interpersonal aspects of work, and management style (National Institute of Occupational Safety and Health [NIOSH], 1996). In the context of occupational health psychology, *work reorganization* denotes interventions that change work organization variables, in an effort to alleviate stress-related outcomes, such as mental ill-health, job dissatisfaction, sickness absence, and poor work performance. Largely, the wide-ranging call for the use of work reorganization to improve these outcomes has gone unanswered or the responses have been incomplete (e.g., NIOSH, 1996). In particular, there is a lack of methodologically sound, empirical research that has investigated this strategy for reducing and preventing mental ill-health. Furthermore, the mechanisms by which these interventions improve stress-related outcomes have not been investigated, using commonly recommended, rigorous, procedures (see Barnett, Gareis, & Brennan, 1999; Baron & Kenny, 1986; Kenny, 1998).

Occupational health psychology theories posit a number of work characteristics by which work reorganization interventions may improve stress-related outcomes (see Parker & Wall, 1998). The one that is identified most ubiquitously appears to be job control, or the extent to which people have discretion and choice in their work. The primary goal of the 12-month, longitudinal, quasi-experiment described here was to determine in a rigorous manner whether a work reorganization intervention can actually improve stress-related outcomes by increasing

people's job control. We sought to do this within the context of our second objective, which was to examine the effectiveness of this type of intervention for stress reduction, in a United Kingdom (UK) central government department.

Job control, stress-related outcomes, and work reorganization interventions

The job characteristics model (Hackman & Lawler, 1971; Hackman & Oldham, 1975; Turner & Lawrence, 1965), the sociotechnical systems approach (e.g., Cherns, 1976; Emery & Trist, 1960), action theory (Frese & Zapf, 1994; Hacker, Skell, & Straub, 1968), the demands-control model (Karasek, 1979), and the job design theory of stress (Carayon, 1993) all hypothesize that providing people control over their work serves to improve stress-related outcomes. In line with these theories of work control and employee well-being, Terry and Jimmieson (1999) noted, in their review of this research literature, that there appears to be “consistent evidence” that high levels of worker control are associated with low levels of stress-related outcomes, including anxiety, psychological distress, burnout, irritability, psychosomatic health complaints, and alcohol consumption (p. 131). In addition, negative relationships have been found between job control and absence rates, but only when job demands are high (Dwyer & Ganster, 1991). Finally, low job control has been shown to predict new reports of coronary heart disease, amongst London-based civil servants (Bosma, Marmot, Hemingway, Nicholson, Brunner, & Stansfeld, 1997). These stress theory concordant findings are welcome, as many field based, work reorganization outcome studies use the promotion of job control as a core strategy for attempting to improve stress-related outcomes (e.g., Jackson, 1983; Landsbergis & Vivona-Baughan, 1995; Murphy & Hurrell, 1987; Pierce & Newstrom, 1983; Wall & Clegg, 1981; Wall, Kemp, Jackson, & Clegg, 1986).

Even though it is popular for work reorganization interventions to promote well-being through enhancing job control, we have not been able to identify any studies that have tested

rigorously the ability of these programs to improve stress-related outcomes, by means of this mechanism, or mediator¹. There have, however, certainly been work reorganization outcome studies that have tested for relationships between improvements in job control and stress-related outcomes. For example, Parker, Chmiel, and Wall (1997) found a significant relationship between increases in control and job satisfaction, four years after a chemical processing plant instituted strategic downsizing in association with an “empowerment initiative”. In contrast, Jackson and Martin (1996) found that changes in timing control (i.e., control over work scheduling) were not associated with changes in psychological strain or job satisfaction, seven months after a manufacturing plant instituted a just-in-time production system. Taken together, these two studies present the typically conflicting findings regarding whether actual changes in control are associated with changes in well-being at work.

Regardless, these studies, and others like them (e.g., Jackson & Mullarkey, 2000; Mullarkey, Jackson, & Parker, 1995), have attempted to test for an association between improvements in control and stress-related outcomes. However, they have not employed the rigorous, statistical procedures (see Barnett et al., 1999; Baron & Kenny, 1986; Holmbeck, 1997; Kenny, 1998) that are needed to assess whether or not any such relationships result from job control mediating stress-related outcomes. For example, the association between increased control and well-being that Parker et al. (1997) noted may have occurred for one of two reasons. First, it may be because control actually served as a mechanism, or mediator, by which the “strategic downsizing initiative/empowerment program” improved job satisfaction; or, second, the program independently affected both control and job satisfaction (i.e., a non-mediating explanation). In the event, it is just not clear which alternative is correct, as these researchers, like most others (e.g., Carayon, 1993), did not use tests that could determine this.

¹ Consistent with Tubré, Bly, Edwards, Pritchard, and Simoneaux’s (2001) recommendations for conducting a thorough literature review, we attempted to identify such studies through: electronic subject indexes (e.g., PsycINFO), citation searches (e.g., Social Science Citation Index), consultation with other researchers in the field, and “reference chasing”, or searching the reference sections of relevant empirical and review articles.

Thus, the primary goal of the present study is to use a research design and statistical tests that can adequately test for mediation, and, hence, rigorously examine whether control is a mechanism by which a work reorganization intervention improves stress-related outcomes. Such rigorous assessment of potential mechanisms of change is necessary, as interventions of all kinds can be effective for reasons different from those hypothesized (see Bond & Bunce, 2000). By confidently identifying these mediators, one can improve interventions so as to manipulate these variables more effectively.

Control-enhancing work reorganization initiatives, and their effects on stress-related outcomes

As just noted, the hypothesis that a work reorganization intervention can improve stress-related outcomes, by increasing people's job control, has not been examined previously, using both methodologically and statistically rigorous methods. Research has, however, examined the extent to which work reorganization initiatives that seek primarily to increase job control can improve stress-related outcomes. Unfortunately, many of these studies (e.g., Cordery, Mueller, and Smith, 1991; Murphy & Hurrell, 1987; Pierce & Newstrom, 1983; Wall & Clegg, 1981) lack the inclusion of a comparison group and a follow-up period, thus making interpretation of findings problematic.

Those few studies that do use these two, essential design features (e.g., Griffin, 1991; Jackson, 1983; Landsbergis & Vivona-Vaughan, 1995; Wall, et al., 1986) do not provide very encouraging support for the effectiveness of control-promoting, work reorganization initiatives on stress-related outcomes. In fact, only these studies by Wall et al. (1986) and Griffin (1991) appear to have demonstrated that such a program can significantly improve stress-related outcomes at a final observation point, using a longitudinal and quasi-experimental design. Specifically, Wall et al.'s intervention of instituting autonomous work groups significantly improved intrinsic job satisfaction at their 30-month follow-up; and, Griffin's intervention,

which sought to increase autonomy and other work characteristics (e.g., task identity), improved supervisors' evaluations of subordinates at his 48-month follow-up.

It should be noted that there are a few work reorganization outcome studies that are somewhat relevant to the present one, but not directly. First, Schaubroeck, Ganster, Sime, and Ditman (1993), who demonstrated that a work reorganization intervention could improve the job satisfaction of supervisors in a business division of a university; however, their intervention, involving a role-clarification program, did not try to achieve these outcomes by increasing people's work control, as did ours. Second, Bunce and West (1996) and Bond and Bunce (2000) conducted two experiments that demonstrated that an intervention could improve people's well-being by encouraging them, where possible, to reduce their own work stressors (e.g., asking for clarification regarding one's expected roles); however, unlike the present intervention, these two programs aimed to improve work reorganization at the individual level, whereas the present one attempted to do so at the departmental level. Also, unlike the present study, these two individual-directed interventions did not try to improve stress-related outcomes by increasing people's job control.

One reason for the less-than-optimal outcomes from control-enhancing work reorganization interventions may concern the process by which they instituted changes. With the exception of Landsbergis and Vivona-Vaughan (1995), none of these programs, which were evaluated using a longitudinal, quasi-experimental design, has allowed employees to influence greatly the types of changes that were going to occur. For example, S.E. Jackson's (1983) change was determined by her and involved "*requiring* [italics added] unit heads to hold scheduled staff meetings at least twice per month" (p. 7), as opposed to the previous practice of once per month or less. Many researchers (e.g., Cahill, Landsbergis, & Schnall, 1995; Parker, Myers, & Wall, 1995; Parker & Wall, 1998; Seeborg, 1978) note that the process of change is as, if not more, crucial than the change itself, and both should be consistent with each other.

Thus, if the goal of a work reorganization intervention is to achieve greater job control, then the process by which that goal is realized should be influenced by the people for whom the change shall affect. One work reorganization strategy for stress reduction that allows for such influence in the change process is participative action research (PAR; Schurman & Israel, 1995), a method that, as just noted, only Landsbergis and Vivona-Vaughan have tested, using a longitudinal, quasi-experimental design. Although their PAR intervention did not improve any stress-related outcomes, we employ this strategy for our work reorganization program, because it is considered the preferred method for such change initiatives (e.g., Karasek, 1992).

In summary, this study attempted rigorously to test whether or not a PAR intervention could improve stress-related outcomes of UK civil servants, by increasing their job control. To put it another way, we examined whether job control served as the mechanism, or mediator, by which our PAR intervention improved stress-related outcomes. According to Baron and Kenny (1986), a mediator (e.g., job control) is a mechanism through which an independent variable (e.g., PAR intervention) influences a dependent variable (e.g., mental health). Consistent with occupational health psychology theories (noted above), we predicted that job control would mediate any improvements in stress-related outcomes that occurred, as a result of the PAR intervention.

Method

Participants

Ninety-seven administrative employees (61 men and 36 women) of a UK central government department participated in this quasi-experiment. These participants were located in a division of 121 people that handled the department's financial planning, auditing, business strategy, and procurement concerns. Fifty-seven percent of participants were between 37 and 55 years-old, and 6.2% were over 55. Forty-three percent of people were university graduates, and

51% could be classified as “middle management”. Ninety-two percent of participants worked full-time, and 67% were married or cohabitating.

Measures

Occupational Stress Indicator: (OSI; Cooper, Sloan, and Williams, 1988): The OSI is a comprehensive measure of job stressors and strain. For the purposes of this study, we used three of its scales to assess stress-related outcomes. These were job satisfaction (5 items, e.g., degree of satisfaction with, “the actual job itself”); physical ill-health symptoms (12 items, e.g., frequency of “indigestion or sickness”), and mental ill-health (18 items, e.g., “Are there times at work when you feel so exasperated that you sit back and think to yourself that ‘life is all really just too much effort’?”). To help identify work organization factors over which our intervention could increase job control, we used the Sources of Stress scale (61 items, e.g., the extent to which “a lack of encouragement from superiors” is a source of stress). Time 1 (pre-test) and Time 2 (post-test) alpha coefficients for the OSI scales that we used were all acceptable and ranged from .84 to .95.

Job Control: (Karasek, Gordon, Pietrokovsky, Frese, Pieper, Schwartz, Fry, & Schirer, 1985): This variable was measured by the three decision authority items on the Job Decision Latitude scale, from the Job Content Questionnaire (Karasek et al., 1985). Previous research by Smith, Tisak, Hahn, and Schmieder (1997) indicate that these scale items constitute a robust measure of job control. Time 1 and Time 2 alpha coefficients for job control were .74 and .80, respectively.

Self-rated performance: This one item-scale was on a seven-point Likert-type scale that ranges from “very poorly” (1) to “extremely well” (7). The item read: “How well do you think that you have performed in your job, recently?”.

Sickness absence: This was measured using a “time-lost index”, or a person’s total number of absent days per year due only to sickness (Warr, 1996). This index was calculated

from personnel records, and we compared the sickness absence rates from the year before pre-test (i.e., the year before Time 1) with those from the year before post-test (i.e., the year from Time 1 to Time 2).

Procedure

Table 1 illustrates the design of this study. The department contacted us, after a staff survey indicated that people “felt under stress”. The department wanted advice on how it could reduce this problem, and we recommended a participative action research (PAR) program to achieve their goal of stress reduction (and prevention). PAR is a specific model of work reorganization that attempts to meet both organizational goals (e.g., improved mental health) and research objectives (e.g., theory contribution), through a collaborative process that occurs between a change agent and organization members (Israel, Schurman & House, 1989). This collaborative relationship applies to all areas of the intervention process, from diagnosis (e.g., What should we measure?) to intervention selection (e.g., How do we modify this source of stress?) and evaluation (e.g., What constitutes success?). Through this model, the expertise of both the change agent and organization members can be harnessed to increase the chances for efficacious work reorganization.

We wished to test the PAR program in a departmental division comprised of units that were similar in terms of people’s educational achievement, age, and gender. We also wanted each of these units to have a similar, and wide, range of grades, or ranks. Finally, to minimize the potential contamination between treatment and control conditions, we wanted at least most of the units to be in separate buildings and certainly non-overlapping. To meet these ends, we chose, in consultation with the department, a division that consisted of 121 people. Each unit in this division had different core tasks, but each faced similar levels of time pressures and work load, as the entire division reported to, and carried out the requests of, one government minister.

Furthermore, each unit of the division was typically involved in the work required for each ministerial request, or project.

The week in which all of the participants completed the above measures for the first time is referred to as Time 1. In all, there were two observation times, with the second one (i.e., Time 2) occurring 12 months after Time 1. At Time 1, we used a matched-randomization procedure to assign the participating division's six units either to the PAR group or a wait-list control group. (This latter condition was supposed to have received the intervention after the one year follow up (i.e., Time 2); however, because of organizational constraints, the control group never received the intervention.) Our allocation procedure resulted in both groups being matched in terms of sample size (PAR = 48, Control = 49), number of units (3 each), and unit sizes (each group had one unit under 10 people, one unit between 10 and 20 people, and one unit between 25 and 40 people). Thus, this study constituted a quasi-experimental control group design that closely approximated a pretest-posttest control group design (Campbell & Stanley, 1963). (Indeed, as noted in the Results section, there were no significant Time 1 differences between the PAR and control groups, on any of the biographical variables that we assessed. This suggests further that these two groups were equivalent on all relevant variables.)

During the week following Time 1, we informed units as to whether they were in the PAR or the wait-list control group. During that same week, we sought volunteers from the PAR group to participate on a steering committee. Twelve people (7 women and 5 men) volunteered to sit on the committee, and, as desired, volunteers came from all three units and had a wide range of job titles and grades. Frank W. Bond and an "in-house" organizational psychologist facilitated each of the five, two-hour committee meetings that occurred during working hours, over a three month period, beginning one month after Time 1.

The primary aim of the meetings, and PAR, was for committee members to develop and implement work organization changes that might increase people's job control and, thereby,

improve the stress-related variables in their units. To help them identify areas over which to increase work control, we noted that, on the basis of Time 1 data collected from the 3 units in the PAR group, there were several aspects of work organization that were associated with stress-related outcomes. On the basis of these findings, their experiences, and their priorities, committee members decided to develop proposals and action plans to increase workers' job control over three problem areas: assignment distribution procedures, within-unit consultation and communication, and informal performance feedback.

In accordance with PAR, committee members offered everyone in their respective units opportunities to discuss and influence the proposed work reorganization strategies, before they were finalized and implemented. Each unit in the PAR group met the committee's goals of having two work reorganization strategies implemented, by the beginning of Month 5 of the project. One such strategy that each unit in the PAR group implemented was a formal (and very popular) procedure whereby every unit member was able to recommend and comment on ways that his or her tasks were grouped, assigned, and fulfilled. In one of the division's units, this innovative procedure resulted in administrative assistants establishing the practice of having quick, informal morning meetings to allocate, amongst themselves, the work required of them and/or establish the working methods needed to meet their deadlines. This allowed them to manage their workload in a more participative, controllable, planful, and equitable manner.

Each of the three PAR units also implemented a unique work reorganization strategy, to provide people with job control over specific aspects of work. For example, one of the units devised a very brief "email feedback form" that could be sent to people's supervisors, if they were unsure about how they accomplished a task. This worker-initiated request for information provided people with fast feedback that could quickly shape any task behaviors and, thus, over time, provide people with a sense of mastery, or control, over their work (Karasek & Theorell, 1990). Line supervisors agreed to respond to received forms, twice weekly.

Results

Biographical variables

Table 2 provides the Time 1 means, standard deviations, and, where appropriate, category information (e.g., female = 0, male = 1) for the biographical variables that we examined. Chi-square and analysis of variance (ANOVA) statistics revealed, as mentioned above, no significant Time 1 differences between the PAR and control group, on any of the biographical variables.

Bivariate relationships and comparisons to OSI norms

Intercorrelations amongst all variables at Time 1 are presented in Table 2. [Time 2 intercorrelations are not presented, as the result pattern was similar to that of Time 1.] Consistent with occupational health psychology theories (e.g., Hackman & Oldham, 1975; Karasek, 1979), low levels of job control were significantly associated with high levels of mental ill-health, absenteeism, physical-ill health symptoms, and low levels of job satisfaction.

The OSI means in Table 2 indicate that our participants may have been experiencing a higher level of stress-related outcomes, compared with other UK workers. Specifically, when compared to a normative sample of British managers in a range of organizations (see Cooper et al., 1988), the participants in the present study were in the 68th percentile for mental ill-health, the 99th percentile for physical ill-health symptoms, and the 19th percentile for job satisfaction. Thus, for example, 68% of British managers indicated better mental health than these participants, and 81% of these managers reported greater job satisfaction than these division members.

Outcome variables

Because of participant attrition, and consequent listwise deletion, the Time 2 observation

period had the following group sizes for the self-report (or questionnaire-based) variables, PAR = 27, Control = 26, down from Time 1 sizes of 48 and 49, respectively. Thus, the attrition rate was 56% for the PAR group and 53%, for the control group. Turnover accounted for part of this attrition, with 2 people in the former condition and 6 people in the latter one leaving the organization during the year of the study. A chi-square test indicated that this difference in turnover, whilst consistent with the stress reduction goals of PAR, was non-significant. This turnover rate meant that the analysis of sickness absence data, obtained from personnel records, was based on the following group sizes, PAR = 46, Control = 43. Chi-square and ANOVA analyses revealed no significant Time 1 differences on any biographical, mediator, or outcome variable, between participants who dropped-out and those who remained in the study. With the Time 2 sample size for the self-report variables, there was an approximately 70 percent chance of detecting medium-sized main and interaction effects for the Group (PAR and Control) and Time (1 and 2) variables, using a two-tailed alpha level of .05 (Cohen, 1988). According to Cohen (1977), effect sizes, measured using eta-squared (η^2), are small at .01, medium at .09, and large at .25.

To examine whether PAR led to improvements on the outcome variables, we conducted first a 2 x 2 repeated measures multivariate analysis of variance involving all dependent and mediator variables. Group (PAR and Control) served as the between-subjects variable, and Time (Time 1 and Time 2) as the within-subjects variable. This procedure identified a significant Group x Time interaction, $F(6, 40) = 2.64, p = .030, \eta^2 = .28$, and a significant effect for Time, $F(6, 40) = 3.04, p = .015, \eta^2 = .31$

Given these large and significant multivariate effects, repeated-measures ANOVAs were performed for each dependent and mediator variable. Where significant main or interaction effects were found, all four possible simple effects tests (i.e., pairwise comparisons) were conducted. To prevent the experimentwise error rate from inflating, we adjusted alpha levels for

the simple effects tests, using a Bonferroni correction (Pedhazur & Schmelkin, 1991). Also, when conducting these simple effects tests, we used the Time 1 score, for the variable being examined, as a covariate, but only for between-group comparisons at Time 2. Means and standard deviations for each variable by condition are listed in Table 3. In both table 3, and the text below, only significant effects are presented. It should be stated here that the PAR and control groups did not differ, at Time 1, on any outcome or mediator variable.

Mental Ill-Health. As can be seen in Table 3, there was a significant Group x Time interaction for this variable. Simple main effects tests indicated that mental ill-health scores significantly improved (i.e., decreased) from Time 1 to Time 2, in the PAR group, $F(1,50) = 6.46, p = .014, \eta^2 = .11$; and, at Time 2, they were significantly lower (i.e., healthier), than they were in the control group, $F(1, 49) = 7.57, p = .016, \eta^2 = .13$. According to Cohen's (1977) specifications, both of these significant differences were of a medium magnitude. When compared with a normative sample of British managers in a range of organizations, this decrease in mental ill-health amongst PAR group members moves these participants from the 82nd percentile for this variable at Time 1 to the 73rd at Time 2.

Sickness Absence. Table 3 indicates that there was a significant Group x Time interaction for this variable. Simple main effects indicated that this resulted from a "small" but significant decrease in sickness absence in the PAR group, from the year to Time 1 to the year to Time 2, $F(1, 87) = 6.32, p = .028, \eta^2 = .07$; and, for the year to Time 2, the PAR group had significantly less sickness absence than did the control group, $F(1, 86) = 8.42, p = .010, \eta^2 = .09$; a difference that was of a medium magnitude.

Self-Rated Performance. Table 3 shows there was a significant Group x Time interaction for this variable. Tests of simple effects revealed that self performance ratings increased (i.e., improved) significantly from Time 1 to Time 2 in the PAR condition, $F(1, 46) = 6.80, p = .01, \eta^2 = .13$; and, at Time 2, they were significantly higher, than scores in the control

group, $F(1, 45) = 12.86$, $p = .002$, $\eta^2 = .22$. Both of these significant differences were of a medium magnitude.

Physical Ill-Health Symptoms. There were no significant effects for this variable, although, the Group x Time interaction approached significance, $F(1, 49) = 3.68$, $p = .061$, $\eta^2 = .07$.

Job Satisfaction. There were no significant main or interaction effects for this variable.

Testing the mediator variable

A principal aim of this research was to identify the extent to which variation in job control explained any significant interaction effects that occurred for our outcome variables: mental health, sickness absence, and self-rated performance. Such analyses allow us to test occupational health psychology theories that suggest that work reorganization interventions can improve stress-related outcomes by increasing job control. First, however, we detail changes in this proposed mediator variable, job control, as a function of the PAR and control groups. As the goal of the PAR intervention was to increase participants' job control, examining the changes in this variable serves as a manipulation check for the independent variable. As we now show, results indicate that the PAR program did increase people's job control, in relation to the control group.

Job Control. Table 3 indicates a significant Group x Time interaction and a significant group effect for this variable. Tests of simple effects revealed that job control increased significantly, and to a "large" extent, in the PAR group between Time 1 and Time 2, $F(1, 51) = 20.36$, $p < .000$, $\eta^2 = .29$. Furthermore, at Time 2, the PAR group reported significantly more control over their work than did the control group, $F(1, 50) = 10.93$, $p = .004$, $\eta^2 = .18$; a difference of a medium magnitude.

We should note here that 10 of the 12 steering committee members completed the questionnaires at Time 2. At this observation point, their responses on all outcome and mediator variables did not differ significantly from PAR group members who did not sit on this committee. This lack of difference may have been unanticipated if Time 2 had occurred shortly after the steering committee meetings ended. Recall, however, that members had ceased their committee work eight to nine months before the Time 2 observation point, thus allowing for any bias, stemming directly from their service on the committee, to have greatly attenuated.

Baron and Kenny (1986; Kenny, 1998) state that a given variable, M, functions as a substantial mediator, when a significant effect of an independent variable, X, on a dependent variable, Y, is rendered non-significant, after controlling for M. On the basis of this criterion, data presented below and in Table 4 are clearly consistent with the suggestion that changes in job control fully mediate the improvements that are seen in the PAR group. These improvements occur, of course, for mental ill-health, sickness absence, and self-rated performance. To elaborate, we established full mediation by using hierarchical regression equations that constitute the “four tests for mediation” recommended by Baron and Kenny (1986; Kenny, 1998) (see Table 4). These are as follows:

Test 1: Establish that the predictor variable is correlated with the outcome variable. This step determines if there is, indeed, an effect to be mediated.

Test 2: Establish that the predictor variable is correlated with the mediator. This step treats the proposed mediator as an outcome variable.

Test 3: Establish that the mediator is correlated with the outcome variable, whilst controlling for the predictor variable. Such control is necessary, as the mediator and outcome variables could be correlated, because they are both caused by the predictor variable.

Test 4: If M completely mediates the X – Y relationship, then this relationship should become zero, when controlling for M. The regression equation used for Test 3 is used to establish this effect.

As can be seen in Table 4, the significant effects of group on the changes in, mental ill-health, sickness absence, and self-rated performance reduced to non-significance, after controlling for change in job control. Such findings are consistent with the hypothesis that the increase in job control that occurred in the PAR group fully mediated all of the improvements that were seen in this condition. As noted earlier, no significant changes occurred in the Control group.

Discussion

Outcomes in context

This study makes two unique and significant contributions to the occupational health psychology literature. First, it appears to be the first longitudinal and quasi-experiment to demonstrate that a work reorganization intervention for stress reduction can produce, at a final, follow-up observation point, significant improvements in both work-related outcomes (e.g., sickness absence rates) and a health-related outcome (e.g., mental ill-health). Furthermore, to our knowledge, it is the first study to examine the mechanisms, or mediators, by which such an intervention produced its improvements, using commonly recommended, rigorous, statistical procedures (see Baron & Kenny, 1986; Holmbeck, 1997; Kenny, 1998). Specifically, this study found that the present work reorganization intervention, consistent with occupational health psychology theories (e.g., Cherns, 1976; Frese & Zapf, 1994; Hackman & Oldham, 1975; Karasek, 1979), improved participants' mental health, sickness absence rates, and self-rated performance, because it increased their job control.

To elaborate on the results, it appears that only a few other work reorganization outcome studies (e.g., Griffin, 1991; Jackson, 1983; Landsbergis & Vivona-Vaughan, 1995; Schaubroeck et al., 1993; Wall et al., 1986) have employed a longitudinal and quasi-experimental design; furthermore, when compared with the present one, these studies do not seem to have produced results that are as positive. For example, of these previous studies, only S.E. Jackson's (1983) showed any significant improvement in participants' mental health (as a result of a participation in decision making program). This increase, however, was seen three months after the intervention ended (i.e., baseline + 6 months), but not six months afterwards (i.e., baseline + 9 months). The present study showed such an improvement in mental health nine months after our PAR intervention ended (i.e., baseline + 12 months), and it was of a medium, not a small, magnitude (Cohen, 1977).

Furthermore, of these previous, longitudinal, quasi-experiments, only Griffin's (1991) found an improvement for a work-related variable: supervisors' evaluations of subordinates. Regrettably, we were not successful in persuading the host organization to allow us to obtain such evaluations. However, we did find significant changes, for the better, in both sickness absence rates and people's ratings of their own work performance, at the follow-up (Time 2).

We did not find any significant changes in job satisfaction, as a result of our PAR intervention. This may not be entirely surprising, as most other longitudinal, quasi-experimental field studies have not found long-term impacts for this variable. For example, the improvements in job satisfaction that S.E. Jackson (1983) and Griffin (1991) noted, at 3 and 6 months respectively, attenuated to non-significance at their final follow-ups that occurred at 9 and 48 months, respectively. Schaubroeck et al. (1993) did find a decrease in supervisor dissatisfaction at their final observation point, but this was only 3 months after their intervention ended. Perhaps, we too might have found improvements in job satisfaction, if we had assessed this variable at a 3 or 6 month follow-up, instead of our 12 month one.

The exception to these limited results for job satisfaction, comes from Wall et al. (1986), who found a significant increase in intrinsic job satisfaction, 30 months after their baseline observation. Wall et al. implemented autonomous workgroups in a manufacturing setting, which was a profound organizational change that probably affected many of the participants' work characteristics (e.g., autonomy, task significance, skill variety, task identity, and feedback from the job). In contrast, the interventions of Griffin (1991), S.E. Jackson (1983), Landsbergis and Vivona-Vaughan (1995), and Schaubroeck et al. (1993), as well as ours in the present study, were far more limited, as they focused on more discrete issues of control promotion, such as greater participation in some decision making, improving communication, and clarifying roles. It may be, therefore, that job satisfaction, unlike mental health, is a variable that is determined by a large number of work characteristics, many of which may be difficult to change, long-term, in all but the most comprehensive of work reorganization interventions. Furthermore, it is conceivable that people's expectations for what they want, and what they can get, from their job increases as the result of an intervention; and, these expectations are unlikely to be met, except in the most profound of work reorganization initiatives. In the end, more outcome research is clearly needed, in order to understand better the work organization factors that affect (perhaps differentially) job satisfaction, and the other stress-related outcomes examined in this study.

Finally, we failed to see a significant Group x Time interaction for symptoms of physical ill-health, at conventional levels of statistical significance. It may be that if the power of this study had been a bit greater (i.e., if we had had more participants), then this nearly significant effect (at $p < .061$) may have reached significance. Alternatively, it is possible that our PAR intervention was just not able sufficiently to affect this variable.

We believe that our encouraging results were due to our use of a PAR model, which allowed employees to participate in all stages of the intervention process. Of the previous longitudinal quasi-experimental studies that tested a work reorganization intervention, only one

employed a PAR methodology (i.e., Landsbergis & Vivona-Vaughan, 1995). Although, theirs was not successful in reducing stress-related outcomes, the results from our program may encourage others to conduct more PAR intervention outcome studies. In this way, we may be able to establish the circumstances under which a PAR intervention can promote and protect mental health- and work-related outcomes.

The mediator of change: Job control

The primary goal of this study was to test occupational health psychology theories that posit that stress-related outcomes can be improved by increasing people's control over their work (e.g., Cherns, 1976; Frese & Zapf, 1994; Hackman & Oldham, 1975; Karasek, 1979). Consistent with his hypothesis, we did indeed find that the PAR intervention improved people's mental health, sickness absence rates, and self-rated performance, because it increased people's control over their work. That is, job control served as the mediator by which PAR produced its beneficial effects. This was seen statistically when the significant effects of the Group variable (i.e., PAR and control) on the mental health, sickness absence, and self-rated performance variables became non-significant, after we controlled for job control. To our knowledge, this is the first study that has tried rigorously to identify any mediator of change for a work reorganization intervention for stress reduction.

Identifying job control as a mediator of change in our intervention could be particularly helpful to the theory and practice of work reorganization programs. It may suggest that such interventions could increase their efficacy by using strategies that attempt to increase people's control over their perceived pressures. If additional studies confirm our mediator findings, then future research could help further to increase the efficacy of work reorganization interventions by determining exactly how control produces its effects in these types of programs. There are

several potential explanations for these effects of control (see Frese, 1989), including one proposed by Karasek and Theorell's (1990) demands-control model of occupational stress.

This theory hypothesizes that job control improves stress-related outcomes, because, with such control, people can actively *learn* effective strategies for meeting and emotionally coping with work-related challenges and tasks. This "learning through control" hypothesis is also consistent with the psychopathology, dispositional, and behavioral theories that are advocated by Abramson, Seligman, and Teasdale (1978), Beck and Emery (1985), Barlow (1988), Lang (1985), and Lazarus (1991). Given these numerous, consistent hypotheses as to how control affects stress-related outcomes, it seems prudent to establish whether or not learning actually does serve as a mediator for this effect. It is by understanding how control improves these outcomes, that we can develop organizational-level interventions that emphasize this variable and, thereby, make these programs more efficacious in promoting mental health and work effectiveness (e.g., Bond & Bunce, 2000).

Methodological issues and limitations

Not surprisingly, our study suffers from several limitations that are common amongst work reorganization outcome studies. Firstly, we have inevitably had to use a quasi-experimental design and are, therefore, left open to various threats to internal validity (see Campbell & Stanley, 1963). We tried to reduce these threats by closely approximating a pretest-posttest control group design. We achieved this by selecting participating units in the same manner (i.e., based upon division membership), and by forming the PAR and control groups from pre-existing units in a random, experimenter-controlled fashion (Campbell & Stanley). Whilst these steps should help to limit our exposure to internal invalidity, we cannot, of course, be immune to it.

For example, we believe that we are potentially vulnerable to such a validity threat, as a result of possible differential mortality having occurred, across the two groups. Specifically, although attrition rates were fairly similar between the PAR (56%) and control (53%) conditions for the self-report variables, it is possible that the two groups lost people for systematically different reasons. It is unclear, however, what these may be; as just noted, we closely approximated a pretest-posttest control group design, and, consistent with this, the two groups did not differ on any biographical, mediator, or outcome variable at Time 1. Also, there were no significant differences on these variables, between those who remained in the study and those who dropped out. For these reasons, we do not believe that mortality is likely to pose a significant threat to the internal validity of our study (see Campbell & Stanley, 1963).

We have identified one possible explanation for our relatively high attrition rate. Namely, Time 2 of our study coincided with the end of the first two years of a new government's term of office, during which a flurry of new legislation and policy were constantly being formed and implemented. Discussions with management, union officials, and individual employees clearly suggested that high and sustained levels of work occurred during this period, colloquially termed the "two-year marathon". Thus, the response rate to our Time 2 questionnaire may have suffered, as it occurred at the end of this episode of consistently high workloads. It is also worth noting that this period of high work demands from Time 1 to Time 2 may account for the nonsignificant increase in mental ill-health scores that was observed amongst control group members. This trend may serve to underline the value of work reorganization interventions, as our PAR group members' mental ill-health scores significantly decreased.

The findings from the sickness absence data suggest that the high mortality rate for the self-report data may not pose a large threat to the external validity of the study. Specifically, results from personnel records indicated a significant decrease in sickness absence in the PAR

group, from the year to Time 1 to the year to Time 2; and, for the year to Time 2, the PAR group had significantly less sickness absence than did the control group. These findings were based upon a Time 2 sample, in which the attrition was only eight people. These results would indicate that many people benefited from the PAR intervention, even if they did not complete the self-report questionnaires at Time 2.

Another potential limitation of our design concerns our use of a wait-list control group. In particular, because we did not use a control group that received some “inert” intervention (i.e., a placebo), it is possible that the effects of the PAR intervention were caused by a “Hawthorne effect”. As S.E. Jackson (1983) noted, this is particularly likely when (a) participants know that they are involved in a study, and (b) the follow-up observation point occurs soon after the intervention has ended. In the present study, our participants did know that they were in a study that was part of their organization’s “better work management” initiative. However, regarding the second point, the Time 2 observation occurred nine months after the formal steering committee meetings ended, and at least eight months after the work reorganization intervention strategies had been implemented. It may be, unlikely, therefore, that a Hawthorne effect would be present, 8 – 9 months after the initiation of two intervention strategies.

In conclusion, our findings demonstrate that, compared with a control group, a work reorganization intervention provides significant benefits to participants in terms of mental health, self-rated performance, and sickness absence. Moreover, we obtained substantial evidence that those benefits were mediated by increases in job control. These results lend strong support to occupational health psychologists (e.g., Quick et al., 1997) who advocate the introduction of work reorganization programs as an effective means of achieving improvements in workers’ mental health and productivity. Future research may wish to examine the generalizability of our findings to non-governmental organizations; and, investigate, as noted

above, the reason why job control mediates changes in a work reorganization intervention. Such information would be valuable for improving the efficacy of such programs and, hence, the benefits that they can provide to organizations and the people who work for them.

References

- Abramson, L.Y., Seligman, M.E.P., & Teasdale, J. (1978). Learned helplessness in humans: Critique and reformulation. Journal of Abnormal Psychology, *87*, 49 – 74.
- Barlow, D.H. (1988). Anxiety and its disorders: The nature and treatment of anxiety and panic. New York: Guilford.
- Barnett, R.C., Gareis, K.C., & Brennan, R.T. (1999). Fit as a mediator of the relationship between work hours and burnout. Journal of Occupational Health Psychology, *4*, 307 – 317.
- Baron, R.M., & Kenny, D.A. (1986). The moderator-mediator variable distinction in psychological research: Conceptual, strategic, and statistical considerations. Journal of Personality and Social Psychology, *51*, 1173 - 1182.
- Beck, A.T., & Emery, G. (1985). Anxiety disorders and phobias: A cognitive perspective. New York: Basic Books.
- Bond, F.W. & Bunce, D. (2000). Mediators of change in emotion-focused and problem-focused worksite stress management interventions. Journal of Occupational Health Psychology, *5(1)*, 156 – 163.
- Bosma, H., Marmot, M.G., Hemingway, H., Nicholson, A.C., Brunner, E., & Stansfeld, S.A. (1997). Low job control and risk of coronary heart disease in the Whitehall II (prospective cohort) study. British Medical Journal, *314*, 558 – 564.
- Bunce D., & West, M.A. (1996). Stress management and innovation at work. Human Relations, *49(2)*, 209 - 232.
- Cahill, J., Landsbergis, P.A., & Schnall, P.L. (1995). Reducing occupational stress. Paper presented at the American Psychological Association's Work, Stress and Health '95 Conference, Washington D.C.
- Campbell, D.T., & Stanley, J.C. (1963). Experimental and quasi-experimental designs for research. Boston: Houghton Mifflin.

- Carayon, P. (1993). Job design and job stress in office workers. Ergonomics, *36*, 463 – 477.
- Cherns, A.B. (1976). The principles of socio-technical design. Human Relations, *29*, 783 – 792.
- Cohen, J. (1977). Statistical power analysis for the behavioral sciences. San Diego, CA: Academic Press.
- Cohen, J. (1988). Statistical power analysis (2nd ed.). Hillsdale, NJ: Erlbaum.
- Cooper, C.L., Sloan, S.J., & Williams, s. (1988). The occupational stress indicator management guide. Windsor: NFER Nelson.
- Cordery, J.L., Mueller, W.S., Smith, L.M. (1991). Attitudinal and behavioral effects of autonomous group working: A longitudinal field study. Academy of Management Journal, *34*, 464 – 474.
- Dwyer, D.J. & Ganster, D.C. (1991). The effects of job demands and control on employee attendance and satisfaction. Journal of Organizational Behavior, *12*, 595 – 608.
- Emery, F.E., & Trist, E.L. (1960). Socio-technical systems. In C.H. Churchman & M. Verhulst (Eds.), Management science, models and techniques (Vol. 2, pp. 83 – 97). New York: Pergamon.
- Frese, M. (1989). Theoretical models of control and health. In S.L. Sauter, J.J. Hurrell, Jnr., & C.L. Cooper (Eds.), Job control and worker health. New York: Wiley.
- Frese, M. & Zapf, D. (1994). Action as the core of work psychology: A German approach. In H.C. Triandis, M.D. Dunnette & J.M. Hough (Eds.), Handbook of industrial and organizational psychology. Palo alto, CA: Consulting Psychologists.
- Griffin, R.W. (1991). Effects of wok redesign on employee perceptions, attitudes, and behaviors: A long-term investigation. Academy of management Journal, *34*, 425 – 435.

- Hacker, W., Skell, W. & Straub, W. (1968). Arbeitspsychologie und wissenschaftlich-technische revolution. Berlin: Deutscher Verlag der Wissenschaften.
- Hackman, J.R. & Lawler, E.E. (1971). Employee reactions to job characteristics. Journal of Applied Psychology, *55*, 259 – 286.
- Hackman, J.R. & Oldham, G.R. (1975). Development of the Job Diagnostic Survey. Journal of Applied Psychology, *60*, 159 – 170.
- Israel, B.A., Schurman, S.J., & House, J.S. (1989). Action research on occupational stress: Involving workers as researchers. International Journal of Health Services, *19*, 135 – 155.
- Ivancevich, J.M., Matteson, M.T., Freedman, S.M., & Phillips, J.S. (1990). Worksite stress management interventions. American Psychologist, *45*, 252 – 261.
- Jackson, P.R. & Martin, R. (1996). Impact of just-in-time on job content, employee attitudes and well-being: A longitudinal study. Ergonomics, *39*, 1 – 16.
- Jackson, P.R. & Mullarkey, S. (2000). Lean production teams and health in garment manufacture. Journal of Occupational Health Psychology, *5*, 231 – 245.
- Jackson, S.E. (1983). Participation in decision making as a strategy for reducing job-related strain. Journal of Applied Psychology, *68*, 3 - 19.
- Karasek, R.A. (1979). Job demands, job decision latitude, and mental strain: Implications for job redesign. Administrative Science Quarterly, *24*, 285 – 308.
- Karasek, R.A. (1992). Stress prevention through work reorganization: A summary of 19 international case studies. Conditions of work digest: Preventing stress at work, Vol. 11. Geneva: International Labor Office.
- Karasek, R.A., Gordon, G., Pietrokovsky, C., Frese, M., Pieper, C., Schwartz, J., Fry, L., & Schirer, D. (1985). Job content instrument: Questionnaire and user's guide. Lowell, MA: University of Massachusetts, Lowell, Department of Work Environment, Lowell, MA.

Karasek, R. & Theorell, T. (1990). Healthy work: Stress, productivity, and the reconstruction of working life. New York: Basic Books.

Kenny, D.A. (1998). Mediation [On-line]. Available:
<http://nw3.nai.net/~dakenny/mediate.htm>

Landsbergis, P.A., & Vivona-Vaughan, E. (1995). Evaluation of an occupational stress intervention in a public agency. Journal of Organizational Behavior, 16, 29 – 48.

Lang, P.J. (1985). The cognitive psychophysiology of emotion: Fear and anxiety. In A.H. Tuma & J. Maser (Eds.), Anxiety and the anxiety disorders. Hillsdale, NJ: Lawrence Erlbaum Associates.

Lazarus, R.S. (1991). Emotion and adaptation. New York: Oxford.

Lazarus, R.S., & Averill, J.R. (1972). Emotion and cognition: With special reference to anxiety. In C. Spielberger (Ed.), Anxiety: Current trends in theory and research. New York: Academic Press.

Mullarkey, S., Jackson, P.R., & Parker, S.K. (1995). Employee reactions to JIT manufacturing practices: A two-phase investigation. International Journal of Operations and Production Management, 15, 62 – 79.

Murphy, L.R. (1984). Occupational stress management: A review and appraisal. Journal of Occupational Psychology, 57, 1 – 15.

Murphy, L.R., & Hurrell, J.J. (1987). Stress management in the process of organizational stress reduction. Journal of Managerial Psychology, 2, 18 – 23.

National Institute of Occupational Safety and Health (NIOSH, 1996). National occupational research agenda. (NIOSH Publication No. 96-115). Cincinnati, OH: Author.

Newman, J.E. & Beehr, T.A. (1979). Personal and organizational strategies for handling job stress: A review of research and opinion. Personnel Psychology, 32, 1 - 43.

Parker, S.K., Chmiel, N., & Wall, T.D. (1997). Work characteristics and employee well-being within a context of strategic downsizing. Journal of Occupational Health Psychology, 2, 289 – 303.

Parker, S.K., Myers, C., & Wall, T.D. (1995). The effects of a manufacturing initiative on employee jobs and strain. In S.A. Robertson (Ed.), Contemporary Ergonomics. London: Taylor and Francis.

Parker, S. & Wall, T. (1998). Job and work design. London: Sage.

Pedhazur, E.J., & Schmelkin, L.P. (1991). Measurement, design and analysis: An integrated approach. Hillsdale, N.J: Lawrence Erlbaum Associates.

Pierce, J.L., & Newstrom, J.W. (1983). The design of flexible work schedules and employee responses: Relationships and processes. Journal of Occupational Behavior, 4, 247 – 262.

Quick, J.C., Quick, J.D., Nelson, D.L., & Hurrell, J.J. (1997). Preventive stress management in organizations. Washington DC: American Psychological Association.

Schaubroeck, J., Ganster, D.C., Sime, W.E., & Ditman, D. (1993). A field experiment testing supervisory role clarification. Personnel Psychology, 46, 1 – 25.

Schurman, S.J. & Israel, B.A. (1995). Redesigning work systems to reduce stress: A participatory action research approach to creating change. In L.R. Murphy, J.L. Hurrell, S.L. Sauter, & G.P. Keita (Eds.), Job stress interventions. Washington DC: American Psychological Association.

Seeborg, I. (1978). The influence of employee participation in job redesign. Journal of Applied Behavioural Science, 14, 87 – 98.

Smith, C.S., Tisak, J., Hahn, S.H., & Schmieder, R.A. (1997). The measurement of job control. Journal of Organizational Behavior, 18, 225 – 237.

Terry, D.J. & Jimmieson, N.L. (1999). Work control and employee well-being: A decade review. In C.L. Cooper & I.T. Robertson (Eds.), International review of industrial and organizational psychology. Chichester: John Wiley & Sons.

Tubré, T, Bly, P.R., Edwards, B.D., Pritchard, R.D., Simoneaux, S. (2001). Building a better literature review: Reference and information sources for I-O Psychology. The Industrial-Organizational Psychologist, 38, 55 – 59.

Turner, A.N. & Lawrence, P.R. (1965). Industrial jobs and the worker. Cambridge, MA: Harvard University Press.

Wall, T.D., & Clegg, C.W. (1981). A longitudinal field study of group work redesign. Journal of Occupational Behavior, 2, 31 - 41.

Wall, T.D., Kemp, N.J., Jackson, P.R., & Clegg, C.W. (1986). Outcomes of autonomous workgroups: A long-term field experiment. Academy of Management Journal, 29, 280 - 304.

Warr, P.B. (1996). Employee well-being. In P.B. Warr (Ed.), Psychology at work. Harmondsworth, UK: Penguin.

Table 1

The quasi-experimental research design

Group	Time						
	Month 1	Month 2			Month 3	Month 4	Month 13
	Week 1	Week 1	Week 2	Week 3	Week 4	Week 1	Week 1
PAR	O	X	X	X	X	X	O
Control	O						O

Note. PAR = Participative action research intervention; O = Observation time; X = Formal steering committee meeting (i.e., the PAR intervention).

Table 2

Intercorrelations at Time 1

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13
Outcome															
1. M. Health	55.35	12.79													
2. P. Health	33.68	10.12	.574**												
3. Job sat.	80.85	14.65	-.420**	-.307**											
4. Absence			.114	.208*	-.122										
5. Self-Per Mediator	4.82	1.14	-.321**	-.168	.084	.056									
6. Job Control	10.59	2.42	-.303**	-.340**	.408**	-.403**	-.129								
Biographical															
7. Gender	.63 ^a	.49	-.054	-.078	.055	.074	.001	.063							
8. Marital	1.95 ^b	1.56	.115	.234	-.069	-.006	.094	.016	.112						
9. Educ	3.21 ^c	.98	.052	.112	-.032	-.023	.084	.093	.119	.082					
10. Tenure	2.47	2.70	.006	-.095	-.173	-.006	-.081	-.012	.108	-.009	-.071				
11. Grade	5.84 ^d	1.83	-.201	-.148	.064	-.167	.173	.097	-.089	-.038	.099	.091			
12. FT or PT	1.03 ^e	.18	.112	.084	.080	-.052	-.054	.129	-.258*	-.117	-.105	-.102	-.089		
13. Age	2.69 ^f	.58	-.074	-.112	-.212*	-.029	.026	-.010	.069	-.018	-.161	.200	.181	-.114	

Note. M. Health = Mental III-Health; P. Health = Physical III-Health symptoms; Job sat. = Job satisfaction; Absence = Sickness absence; Self-Per = Self-rating of one's

performance; Marital = Marital and cohabitation status; Educ = Highest level of education achieved; Tenure. = Number of years in present job; FT or PT = Full-time or Part-time

worker. ^aFemale = 0; Male = 1 ^bMarried = 1; Single = 2; Divorced = 3; Separated = 4; Widowed = 5; Cohabiting = 6 ^cNo formal qualifications = 1; O level or equivalent (16

years old) = 2; A level or equivalent (18 years old) = 3; University degree level or equivalent = 4; Post-graduate degree level = 5 ^d1 = lowest grade, 9 = highest grade; Other = 10

^eFull-time = 1; Part-time = 2; Occasionally = 3 ^fUnder 21 = 1; 21 – 36 = 2; 37 – 55 = 3; Over 55 = 4.

* p < .05. ** p < .01

Table 3

Means, Standard Deviations, and ANOVA Statistics for the outcome, mediator, and the organizational structure and climate variables, as a function of Group and Time

Variable		Group				ANOVA		
		PAR		Control		Effect	F ratio	df
		<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>			
Mental Ill-Health	Time 1	57.56	11.92	53.19	13.36	GxT	8.60**	1,50
	Time 2	52.27	16.73	58.96	12.94			
Physical Ill-Health	Time 1	33.63	8.99	33.74	11.22			
	Time 2	32.36	11.55	34.08	9.82			
Job Satisfaction	Time 1	78.84	12.36	82.81	16.49			
	Time 2	78.00	17.92	81.73	17.80			
Sickness Absence	Time 1	3.23	3.72	3.02	4.10	GxT	4.26*	1,87
	Time 2	2.02	1.78	3.40	3.73			
Performance	Time 1	4.62	1.21	5.06	1.03	GxT	4.36*	1,46
	Time 2	5.41	1.15	4.73	1.28			
Job Control	Time 1	10.31	2.34	10.86	2.49	GxT	10.33**	1,51
	Time 2	12.70	1.96	10.65	3.25			

Note. Only significant effects are reported. PAR = Participative Action Research; Performance = Self-rating of one's performance; Physical Ill-Health = Physical Ill-Health symptoms; GxT = Group x Time; T = Time; df = degrees of freedom.

* $p < .05$. ** $p < .01$.

Table 4

Hierarchical regression analyses that constitute the four tests for determining whether or not change in job control mediates change in mental ill-health, sickness absence, and self-rated performance, as a result of the PAR intervention

DV	Test	Step	Predictors	β	R^2	ΔR^2
Job Control at Time 2	2	1	Job Control at Time 1	.39**	.15**	
		2	Group	.42***	.31***	.15**
Mental Ill-Health at Time 2	1	1	Mental Ill-Health at Time 1	.59***	.34***	
		2	Group	.30**	.43***	.09**
		3+4	1	Mental Ill-Health at Time 1	.59***	.34***
		2	Job Control at Time 1	-.03	.34***	.00
		3	Job Control at Time 2	-.36**	.51***	.17***
			Group	.15		
Sickness Absence at Time 2	1	1	Sickness Absence at Time 1	.63***	.39***	
		2	Group	.23**	.45***	.05**
		3+4	1	Sickness Absence at Time 1	.77***	.60***
		2	Job Control at Time 1	.15	.61***	.02
		3	Job Control at Time 2	-.24*	.68***	.06**
			Group	.06		

DV	Test	Step	Predictors	β	\underline{R}^2	$\Delta \underline{R}^2$
Self-Rated Performance at Time 2	1	1	Self-Rated Performance at Time 1	.45**	.20**	
		2	Group	-.27*	.27***	.07*
	3+4	1	Self-Rated Performance at Time 1	.45**	.20**	
		2	Job Control at Time 1	.18	.23**	.03
		3	Job Control at Time 2	.55***	.51***	.28***
			Group	-.07		

Note. DV = Dependent variable; β = standardized regression coefficient; $\Delta \underline{R}^2$ = change in the multiple correlation coefficient squared. All tests of the statistical significance of beta weights are two-tailed.

* $p < .05$. ** $p < .01$. *** $p < .001$.