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**The Influence of Employer Support on Employee Management of Chronic  
Health Conditions at work**

**Published in:** Journal of Occupational Rehabilitation, 2009, 19: 333-344

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Running head: Support, self-efficacy and employee illness management

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## **Abstract**

**Introduction:** This study examined the relationship between employer support, self-efficacy and self-management of chronic illness at work. **Method:** 772 employees reporting musculoskeletal pain (n = 230), arthritis and rheumatism (n = 132), asthma (n = 129), depression and anxiety (n = 121), heart disease (n = 80) and diabetes (n = 80) completed a questionnaire distributed across four large organizations. A modified version of the Self-Efficacy to Manage Symptoms Scale and the Self-Management Behaviors Scale. Support from line manager and occupational health were assessed. **Results:** Structural equation modelling analyses revealed that line managers support was directly related to employees' self-management of symptoms and medication at work. All three self-efficacy measures (beliefs about the ability to make adjustments, take medication and manage symptoms at work) partially mediated the relationship between line manager support and the use of medication at work. Self-efficacy beliefs in taking medication and making work adjustments also partially mediated the relationship between line manager support and self-management of symptoms at work. In contrast, there were no direct relationship between occupational health support and two self-management behaviors. Self-efficacy beliefs about making adjustments at work fully mediated the relationship between support from occupational health and self-management behaviors. **Conclusions:** Employer support in developing both symptom-related and work-related self-efficacy for medication adherence and symptom management is important for those working with a chronic illness.

Word count: 153

Keywords: Self-efficacy, self-management behaviors, employer support, chronic health conditions, line managers, presenteeism

## **Introduction**

It is well-recognised that employees with chronic health conditions such as poor mental health and musculoskeletal pain have increased sickness absence and presenteeism compared with healthy employees [1, 2]. Employers and Governments in industrialised countries are keen to reduce the costs associated with both sickness absence and presenteeism associated with chronic health conditions, and there is now recognition that in order to reduce these costs, organizations must invest in health management as a way to reduce symptom burden for the employee and optimise work productivity for those employees with a chronic health condition [3].

Although a number of strategies can be introduced at the organizational level to improve employee health and well-being, for those with a chronic illness, strategies at individual level are also required. One such approach is to enable employees to actively manage their health condition by providing regular health assessments and supporting self-management behaviors. There is strong evidence from the healthcare literature that effective self-management of chronic health conditions by patients leads to better overall physical and psychological health outcomes [4, 5]. Self-management refers to recognising and responding to symptoms, use of medication, managing the impact of the illness on daily functioning, obtaining support from significant others; and is influenced by contextual factors such as social networks, family support, health care providers, and the physical environment [4, 6]. Although occupational health services have a significant role in managing the health and well-being of such employees, and in facilitating employees self-management behaviors; line managers also have a responsibility as they manage the employee on a day to day basis. Both

occupational health and line manager should provide employees with a chronic health condition with support in managing both their health and their work.

Two forms of support typically examined are: emotional (sharing problems) and social (consisting of informational (advice and guidance); and instrumental/practical help) [7]. Social and emotional support are considered to be important aspects of psychological adjustment for many individuals managing a chronic illness [e.g. 8, 9]. These types of support have been associated with increased self-management activities among those with chronic illness [e.g. 10, 11]. In particular, support is reported to facilitate adherence to medication and other forms of treatment, dietary activities, physical activity and other self-managing behaviors among those with a chronic illness [9, 12, 13]. Within the workplace, occupational health support has been associated with medication use in those managing a chronic illness [14]; and line manager support has been related to better work adjustments [15]. Support is considered an important factor in work-related stressor-strain relationships [16] and its influence on job self-efficacy and job performance is well-documented [17].

Although support can have a direct effect on self-management behaviors, according to the social cognitive theory, it can also have an enabling effect on self-efficacy [18]. Self-efficacy refers to ‘belief in one’s capabilities to organize and execute the courses of action required to produce given attainments’ [18]. Self-efficacy beliefs operate along with goals, outcome expectations and perceived social and environmental barriers and facilitators in the regulation of motivation, behavior and well-being [19]. The role of self-efficacy in self-management behaviors has been examined in studies on back pain [20]; arthritis [21]; heart disease [22] and diabetes [23]. These studies

found that patients who maintained high levels of self-efficacy and possessed positive attitudes toward self-management behaviors were more likely to perform those behaviors.

As self-efficacy beliefs determine how social and environmental barriers to self-managing behaviors are perceived, it is argued that the work environment may have a substantial effect on how self-efficacy is shaped and how it determines self-managing behaviors at work. Very few studies have examined the influence of work conditions and self-efficacy on self-management of illness at work [24, 25]. Weijman et al [25] found that employees were able to manage their diabetes in the workplace more effectively if they had high self-efficacy and were able to control their workload, working hours and work pressure. Gignac et al [24] also found employees with arthritis had better health outcomes at work such as reduced symptoms and increased psychological well-being, if they were able to make at least one workplace change to help manage their illness at work. Neither studies examined whether employees' self-efficacy beliefs were shaped internally by their own goals and intentions to manage their illness at work, or shaped externally by factors such as workplace support. Munir et al [26] suggested that workplace support might be a central characteristic to achieving effective self-management of illness at work.

Although support can have a direct effect on self-management behaviors, according to the social cognitive theory, it can also have an enabling effect on self-efficacy [18]. Bandura [19] argues that supportive relationships can enhance self-efficacy through modelling attitudes and strategies for managing problems, providing positive incentives and resources for effective coping.

Therefore, individuals receiving social support are likely to have stronger self-efficacy beliefs, which in turn, may positively influence self-management behaviors. Therefore, the effects of social support might be partially mediated by self-efficacy. Studies have shown the effects of social support on self-efficacy, which in turn, influenced health behaviors including physical activity [27], medication adherence [28] and self-examination [29]. However, not all research shows beneficial effects of social support in promoting self-managing behaviors [30]. Support is only beneficial if it the right type of support from the right source and the right amount [11]. Therefore, for effective management of chronic illness in the workplace, it is likely that workplace support would be important.

As studies have shown support to influence self-efficacy and self-management behaviors within the health literature, and to influence self-efficacy and job outcomes, it is hypothesized that employer support may influence self-efficacy and self-management behaviors in the workplace among those managing a chronic illness. Of particular importance, are the support received from line managers and occupational health, as evidence suggests that both line managers and occupational health professionals play a pivotal role in the health and well-being of employees [31-34]. As line managers and occupational health provide both emotional and practical support to employees [14, 15] this study therefore focused on support received from different sources (e.g. line manager and occupational health) rather than differentiating between types of support received. We therefore hypothesized that there will be 1) a direct relationship between line manager support and self-management behaviors; and between occupational health support and self-management behaviors, among employees managing a chronic illness. In addition, in



line with the social cognitive theory, we hypothesized that 2) the relationship between employer support and self-management behaviors will be mediated by self-efficacy.

## **Method**

### Sample and procedure

This was a cross-sectional questionnaire study and participants were employees from four organizations across three sectors: local government, transport and manufacturing (two companies) based in the United Kingdom. The strategy for approaching employees varied according to organizational size: we approached all employees in the two manufacturing companies (5,000 employees), and randomly selected 1:3 employees in the local government (employing 14,000 employees) and 1:2 employees in the transport organization (employing 12,000 employees).

Questionnaires were distributed to employees via the occupational health departments and completed questionnaires were returned directly to the research team. To monitor overall response rates, the questionnaire asked all employees, independent of their health status for demographic and job-related details. Employees managing a chronic illness were asked additional questions about their health and work.

A 28% response rate was achieved for completed returned questionnaires, of which 72% (4083 participants) had no chronic illness and 28% (1474 participants) reported at least one chronic illness (as diagnosed by their doctor). Although this is a below average response rate for mailed surveys in organizational research [35, 36] it is line with similar studies sending health-related questionnaires to employees in large organizations [37]. The low response rate in this study may also be expected given the study's focus on chronic illness, which may have seemed irrelevant to many workers.

A total of 17 different groups of chronic illnesses were identified from the sample using the International Classification of Diseases (ICD 10, 38). For the purpose of this study, six of these groups were chosen for analysis: musculoskeletal pain (n = 230), arthritis and rheumatism (n = 132), asthma (n = 129), depression and anxiety (n = 121), heart disease (n = 80) and diabetes (n = 80) resulting in a total of 772 participants. These chronic illness groups were chosen for several reasons. First, these illnesses are the most prevalent reported at work in this sample and in national surveys [e.g. 39]. They are also to a great extent, self-managed diseases in that such individuals need to perform various activities by themselves [e.g. 5]. These activities include self-monitoring of symptoms, proper use of medication, appropriate eating plan and regular exercise. Participants in each of six chronic illness groups were only selected if they had been medically diagnosed by their physician, had a minimum disease duration of one year (3 months for participants with musculoskeletal pain or heart disease), if they did not present comorbidity relating to one of the other diseases in the present study and if they were required to carry out self-managing health behaviors at work by their physician. Ethical approval was granted by the University's local ethics committee.

## Measures

*Self-efficacy in managing chronic illness at work:* A modified version of the Self-Efficacy to Manage Symptoms Scale [40] was used to assess participants' confidence in carrying out self-managing behaviors at work. Participants were asked to rate how confident they were in: a) taking prescribed medication related to their chronic illness at work (one item); b) managing symptoms from interfering with work (3 items, managing physical discomfort or pain, monitoring & responding to symptoms,

managing fatigue related to the illness -the mean of the 3 items was used to obtain an overall self-efficacy symptom management scale  $\alpha = 0.85$ ); and, c) making self-changes to work (e.g. using flexible working hours, taking frequent breaks) and asking for work adjustments (e.g. changes to work tasks) to help manage both illness and work performance (2 items, the mean of the 2 items was used to obtain an overall work adjustment scale). Each item began with ‘ how confident are you that you can...’, and was measured on a ten point Likert scale ranging from ‘not at all confident’ to ‘totally confident’. For each item, if a participant was not advised on a particular behavior, or making or asking for work changes was not viable, a ‘not applicable’ response was available for each health self-efficacy question.

*Current self-management behavior at work:* To measure whether participants were carrying out specific illness-related self management behaviors at work, a modified version of the illness symptoms Self-Management Behaviors Scale was used [40] where ‘at work’ was added to the end of each item. Participants were asked to rate how closely they were following the advice of their doctor in: a) taking prescribed medication at work (1 item), and b) managing illness symptoms whilst at work (e.g. managing pain, responding to symptoms; 4 items). Items were measured on a ten point Likert scale ranging from ‘not at all’ to ‘very closely’. For each item, if a participant was not advised on a particular behavior, a ‘not applicable’ response was available for each health behavior question.

*Employer support:* Support consisted of two forms of workplace support: practical support (i.e. giving information and practical help and advice) and emotional support (i.e. demonstration of sympathy and understanding). These were both

measured with three items each, representing support received from line manager and occupational health in the management of chronic illness. As there are no existing measures of workplace support specific to managing a chronic illness at work, these items were developed through interviews and validation with employees reporting a chronic illness and with line managers managing such employees (see (26) for a detailed description). An example of the items are reported in Munir et al. [41]. Items were measured on a five-point Likert scale (no support to a great deal of support) and had an internal consistency of  $\alpha = .68$  and of  $\alpha = .66$ , respectively. As we were more interested in the *source* of support than in examining the *type* of support most received, we calculated a total mean scale score to indicate overall workplace support received by line managers (bivariate correlation was  $r = .74$  between the two support scales) and by occupational health staff managers (bivariate correlation was  $r = .79$  between the two support scales). A higher score indicated more support.

*Illness disclosure:* In order to access support (or for line managers or occupational health to offer support), disclosure of illness by employees is required. Disclosure of chronic illness was measured by asking participants if they had disclosed their illness (name of illness and its symptoms) to their line manager and to occupational health (measured separately for each) [41]. Responses were measured on a five point Likert scale (not at all to full disclosure). For the purpose of this study, disclosure was dichotomised (yes/no).

*Demographics:* Data were collected on age (in years), gender (0= male, 1 = female), tenure (length of employment in years), occupational group (higher managerial and

professional, lower managerial and professional, intermediate, lower supervisory and technical, semi routine and routine occupations; based on National Statistics Socio-economic Classification of eight-digit occupational titles for England and Wales), education (none, GCSE or equivalent, AS and A level or equivalent, and degree). Participants were also asked to rate the severity of their illness symptoms over the past two weeks (mild, moderate and severe).

### Statistical Analyses

Preliminary analyses were conducted using SPSS version 14.0 and showed two variables (self-efficacy medication and self-management of medication) were substantially negatively skewed. These were transformed prior to subsequent analyses. As the variables are inverted, negative associations should be interpreted as positive associations in all analyses.

Differences in the demographic characteristics between the chronic illness groups were compared using chi-square analyses for categorical variables or analyses of variance (ANOVA) followed by Games Howell post hoc analyses (for unequal group size and variance) for continuous variables. Differences between the chronic illness groups on self-efficacy measures and self-management behaviors were compared using univariate analysis of co-variance (ANCOVAs) and Games Howell post hoc test. Age, gender, occupational group, tenure, illness severity and type of work sector were entered as covariates.

In this study we examined the relationship between line manager support and self-management behaviors; and between occupational health support and self-

management behaviors, among employees (hypothesis 1). We also examined the mediating effects of self-efficacy (in managing medication, symptoms and in making adjustments at work) on the relationship between occupational health and line manager support and self-management behaviors regarding medication and symptoms (hypothesis 2). As we were interested in finding overall patterns regardless of illness type, all illnesses were grouped together. Hypotheses were tested using structural equation modeling (SEM) with pairwise deletion (LISREL 8.7) [42]. The maximum likelihood method of parameter estimation was used with the covariance matrix as input. We first tested the direct paths between occupational health and line manager support and the two management behaviors. Then we tested for mediation. Each mediation effect was tested in a series of models. We tested the full mediation effect of efficacy on the relationship between employer support and self-management behaviors. We did this by including three paths from line manager support to self-efficacy symptoms, self-efficacy medication and self-efficacy work adjustments. We also included paths from occupational health support to efficacy symptoms, efficacy medication and efficacy work adjustments. Paths from efficacy symptoms to self-management of symptoms and self-management of medication were included, as were paths from efficacy medication to self-management symptoms and self-management medication and finally, paths from efficacy work adjustments to self-management symptoms and self-management medication. We then went on to test partial mediation. This was done in a stepwise manner as recommended by Chen [43]. First, we added a direct path between occupational health support and self-management of symptoms. Then we added a path between occupational health support and self-management of medication. Third, we added a path between line manager health

support and symptoms management. And finally, we included a path from line manager support to medication management.

M1 serves as a baseline model against which the other, more complex, models (M2, M3, M4, M5) are examined to see if they offer significant gains in explanatory power. Comparison of M1 to other models will reveal which model accounts best for the data. A model is considered to fit the data better than a rival model if the  $\chi^2$  value is significantly lower ( $p < .05$ ) than that of the one to which it was compared. The acceptable levels of fit used to assess the adequacy of each model were according to the recommendations made by Marsh, Balla, and McDonald [44], Anderson, and Gerbing [45] and Brown and Cudek [46].

## **Results**

Demographic details of the different chronic illness groups are presented in Table 1. This was compared with data obtained from each organization's Human Resources department. Participants with chronic illnesses did not significantly differ from their respective colleagues in terms of gender and socio economic status (all  $p > .05$ ). However, those reporting heart disease and arthritis and rheumatism were significantly older than non-responders ( $p < .05$ ).

[Insert Table 1 about here]

Within the sample (Table 1), those with heart disease, diabetes and arthritis and rheumatism were significantly older than the other chronic illness groups,

reflecting the current trend in health statistics. With respect to gender, most participants with arthritis were female and most participants with heart disease and diabetes were male. For illness severity, the majority of participants with asthma, diabetes and heart disease reported their condition to be mild. For diabetes and heart disease, those with moderate to severe conditions are perhaps less likely to be working.

[Insert Table 2 about here]

Table 2 reports the means and standard deviations for self-efficacy and self-management behavior measures for all six chronic illness groups. For self-efficacy measures, ANCOVA revealed significant Group effects for self-efficacy in medication use [ $F(6,572) = 13.45, p < .0001$ ], symptom management [ $F(5,572) = 23.57, p < .0001$ ], and making work adjustments [ $F(5,572) = 6.11, p < .0001$ ]. Games Howell post-hoc test (adjusting for multiple comparisons) showed those with heart disease, diabetes and asthma were more confident in using medication and in managing symptoms compared with the other chronic illness groups ( $p < .0001$ ). For making work adjustments, those with depression and anxiety were less confident compared with all other groups ( $p < .0001$ ). ANCOVA's revealed significant Group effects for medication management behaviors [ $F(5,675) = 15.59; p < .001$ ]. There was no significant group effect for symptom management behaviors [ $F(5,675) = 15.59; p < .001$ ]. Games Howell post-hoc test revealed those with heart disease, asthma or diabetes followed medical advice about taking their medication at work more closely than those with the other illnesses ( $p < .01$ ).

[Insert Table 3 about here]



For illness disclosure, 81% (598/743) of participants had disclosed their illness to their line manager and 54% (406/746) of participants had disclosed their illness to occupational health services. This indicates that examining the support provided by line managers and occupational health is appropriate as many participants had disclosed their illness.

#### Structural equation modelling

The first hypothesis was tested by testing a direct paths model (Model 0): Paths from line manager support to self-management symptoms and self-management medication and from occupational health support to self-management symptoms and self-management medication were included. This model revealed a poor fit to the data.  $\chi^2(1) = 182.49$ , NNFI = .60; CFI = .60; AGFI = .23, RMSEA = .40. However, inspection of the parameter estimates revealed that the paths from line manager support to self-management symptoms and self-management medication were significant at the .001 level. The paths from occupational health to self-management of symptoms and self-management medication were not significant. That the model overall represented a poor fit to the data is an indication that other relationships are important.

The second hypothesis was tested in a series of models. The first fully mediated model (Model 1) testing the mediating mechanism of efficacy behaviors revealed an acceptable fit to the data. AGFI, CFI, and NNFI were all above the recommended level of .90, and the RMSEA was .05 (see table 4), however, RMSEA suggested an acceptable, not excellent, fit to the data, we therefore tested whether the model could

be improved by testing whether partial mediation was at play. Second, we included a direct path from occupational health support to self-management symptoms (M2) to test whether self-efficacy at managing symptoms or making adjustments at work only partially mediated this relationship. This model also represented a good fit to the data. CFI, AGFI and NNFI were all well above .90 and the RMSEA was .05. The  $\Delta \chi^2 (1) = 2.66, p > .05$  revealed that this was not a significantly better model (testing one-tailed), however, the parameter estimates revealed that this path was non-significant and it was therefore not included in subsequent models. Third, we tested partial mediation by including a direct path from occupational health support to medication management (M3). Again CFI, AGFI and NNFI were all well above .90 and the RMSEA was .05. This was not a better model than our original model  $\Delta \chi^2 (1) = 2.80, p > .05$ ; the path was non-significant and was therefore not included in the next model. We then included a direct path from line manager support to the management of symptoms to explore whether self-efficacy of symptoms and self-efficacy adjustment only partially mediated this relationship (M4). CFI and NNFI were both 1.00, AGFI = .99 and the RMSEA was .00 indicating an excellent fit. The  $\Delta \chi^2 (1) = 12.03, p < .001$  revealed that this was a significantly better model than our baseline model and parameter estimates showed that this path was significant ( $p < .01$ ). We therefore included this path in our final mediation model. In this model we also included a path from line manager support to medication management (M5) to test whether self-efficacy only explained part of the relationship between line manager support and the individual's ability to medicate at work. Model fit revealed an excellent fit to the model: AGFI and NNFI = .99 and CFI = 1.00 and the RMSEA was .03. The path from line manager support to medication management was significant ( $p$

< .05) The model represented a better fit to the data than our baseline model;  $\Delta \chi^2 (1) = 15.92, p < .01$ . In figure 1 the final model is illustrated.

Insert table 4 around here

Insert figure 1 around here

In summary, hypothesis 1 was partly confirmed. Direct relationships between line manager support and self-management of symptoms and medication were found, but not with occupational health support and self-management of symptoms and medication. Hypothesis 2 was confirmed. With regard to occupational health, self-efficacy beliefs on the ability to make adjustments at work fully mediated the relationship between support from occupational health, and managing both symptoms and medication at work (due to the transformation of managing medication at work the relationships with this construct is negative). However, self-efficacy beliefs about the ability to manage symptoms *and* medication at work were found not to mediate the relationship between occupational health support and the two self-management behaviors. With regard to line managers, all three self-efficacy measures (beliefs about the ability to make adjustments, take medication and manage symptoms at work) were found to partially mediate the relationship between line manager support and the self-management of medication at work. Self-efficacy beliefs in taking medication and making work adjustments also partially mediated the relationship between line manager support and self-management of symptoms at work. However, self-efficacy beliefs about the ability to manage symptoms at work were found not to

mediate the relationship between line manager support and the self-management of symptoms at work.

## **Discussion**

This study examined the relationship between employer support, self-efficacy and self-management of chronic illness at work. To our knowledge, these links have not been previously examined. Using a large population of employees with various chronic illnesses, we found that overall, those with diabetes, heart disease and asthma reported higher levels of medication self-efficacy and medication self-management at work. Those with depression and anxiety had significantly lower levels of self-efficacy beliefs on the ability to make adjustments at work. These findings are in line with the extant literature on self-management behaviors by chronic illness group [e.g. 25, 41].

We hypothesised a direct relationship between support provided by line managers and occupational health, and self-management behaviors of using medication at work and managing illness symptoms at work. We further hypothesized that this relationship would be mediated by self-efficacy. As such the study allows us to draw two main conclusions on: 1) the relationship between support and self-managing behaviors, and 2) the mediating effect of self-efficacy.

With regard to support, we found limited support for hypothesis 1, whereby a direct path only existed between line managers support and employees' self-management of symptoms and medication at work. No direct relationships were found for

occupational health support and the two self-managing behaviors. Direct support from line managers contributes to the existing literature on the important of support in the management of chronic illness [e.g. 8,9]. It also adds to previous findings on the importance of line manager support in improving stressor-strain relationships [16] and psychological well-being [32, 33], by highlighting the importance of line manager support in the effective management of chronic illness by employees.

When adding work adjustment self-efficacy in our model (hypothesis 2) this confirmed partial mediation between line manager support and the self-managing behaviors. All three self-efficacy measures (beliefs about the ability to make adjustments, take medication and manage symptoms at work) were found to partially mediate the relationship between line manager support and the self-management of medication at work. Self-efficacy beliefs in taking medication and making work adjustments also partially mediated the relationship between line manager support and self-management of symptoms at work. Thus, our findings suggest that line manager support may not only encourage self-managing behaviors at work, but also employees' self-efficacy in making work adjustments and in taking medication to help them better manage their chronic illness at work. In contrast, occupational health support only influenced the two self-management behaviors through the mechanism of self-efficacy in making work adjustments.

Overall, our findings suggest that while both line manager and occupational health support is related to self-management behaviors, the route by which this support is provided are different: line managers provide both direct support and indirect support through employee self-efficacy, and occupational health provide indirect support only

through employee self-efficacy in making work adjustments. It is possible that where employees perceive their line manager to be supportive, they feel confident in their ability to manage their work adjustments, their medication and their illness symptoms and in doing so, are better able to engage in self-management behaviors. In contrast, employees who are struggling to manage their illness at work, are perhaps more likely to be referred to occupational health (either by their general practitioner, their line manager or themselves) for advice, support and possibly intervention. This may raise their confidence in making work adjustments, and it is this ability to make work adjustments that allows the employee to better manage both their symptoms and medication at work. Longitudinal research is required to corroborate these relationships. Both Weijman et al [25] and Munir et al [41] found that outside support was a better predictor for self-management behaviors than workplace support. Future studies should include these measures in order to better detect the relationship between support and self-management, and compare the relative contribution of work and non-work support to illness self-management.

#### The mediating role of self-efficacy

In the final model, self-efficacy was associated with the two self-management behaviors regardless of the source for support (i.e. line manager or occupational health). This supports previous research in that self-efficacy is associated with self-management behaviors in those individuals managing a chronic illness [e.g.20-22]. Our findings add to these studies, in that self-efficacy remains an important psychological mechanism for those managing a chronic illness in the workplace. As self-efficacy is also associated with work related outcomes [16, 17], our findings suggest that high self-efficacy and medication adherence is important to individuals if

they are to continue to maintain employment. Any deterioration in their illness symptoms may negatively affect their work ability. Future research should examine the relationships between self-efficacy, self-management behaviors and both psychological health and work-related outcomes among employees with chronic illness.

Interestingly, while line manager support was related to self-efficacy in taking medication and symptom management, occupational health support was not. It may be that discussions between the employee and occupational health focus on providing advice and guidance regarding ways in which work can be adjusted to support their symptom and medication management. In contrast, due to the daily interaction with line management, the employees' discussions with their line manager may incorporate the way in which work can be adjusted but also the way illness symptoms and medication might be managed at work on a day-to-day basis. Future research should examine more specifically the type of information, advice and interactions that are provided by line managers and occupational health to such employees.

Overall, high self-efficacy in the ability to manage symptoms at work was not associated with actual symptom management. This is surprising, and it is possible that as the study was based in the workplace, higher confidence in making work adjustments and taking medication might be more important to employees in managing their illness symptoms at work. For example, working conditions may be a barrier to effective symptom management and therefore, in order to manage symptoms at work, confidence in asking for, and making work adjustments may be essential. This may include self-efficacy in finding somewhere safe to store and take

medication, taking frequent breaks and working flexible hours to help with monitoring, controlling and responding to symptoms. Further research is required to corroborate these possible explanations.

There are a number of limitations to this study. The study achieved a low response rate of 28% which may represent a potential source of response bias. A number of explanations may account for the low response rates in this study. First, the study was based on self-report data in identifying those with chronic health conditions. For many 'healthy' non-respondents, the questionnaire may have been perceived as irrelevant (even though demographic information was requested from this group) leading to a lower response rate. Second, those with a chronic health condition may have felt uncomfortable in completing the questionnaire, or felt their illness posed no problem at work or simply chose not to fill it in due to lack of time, leading to an under-reporting of health conditions. Third, discussions with participating organizations confirmed observations of survey fatigue despite usage of response-inducing techniques. Nevertheless, the study's response rate is in line with similar studies sending health questionnaires to employees in large organizations [37]. In a study comparing different intensities in recruitment efforts for employees with chronic conditions (recruitment responses ranging from 20.1% to 67.7%), Wang et al. [37] found the estimated prevalences of chronic conditions, levels of work impairment, and effects of chronic conditions on work did not differ with the different recruitment efforts. In our own analysis, demographic comparisons between responders and non-responders indicated no serious problems with response bias. This study utilised Bandura's socio-cognitive theory, which predicts associations between self-efficacy in one's belief in their competence to successfully execute the



required behaviors, the goals people set for themselves, their commitment to those goals, the favourable outcomes they expect from their efforts and the actual behaviors carried out [47]. However, our study did not fully examine these complex associations and a more sophisticated research design is required which measure and test these principles, particularly the role of goal setting in illness management, within the working environment. The SEM presented in this study grouped all illness groups together. Although it is possible to compare two groups in SEM, comparing six groups is more complicated and would have required a larger sample size in two of our illness groups (diabetes and heart disease) to warrant a multi-group SEM. Nevertheless, the aim of this study was to find overall patterns regardless of illness type. Future SEM studies should compare key chronic illness groups, particularly depression, for specific patterns. Although the present study examined the role of workplace support, it was not possible within the scope of the current study, to examine other work measures such as working conditions, autonomy and work stress. These important variables should be included in future studies. Finally, although the study found that line managers' support was directly related to employees' self-management of symptoms and medication at work and that self-efficacy mediated some of these relationships, the cross-sectional nature of the study suggests that the causality of the relationships cannot be ascertained. Further longitudinal research is needed to delineate the direction of these associations as well as to test a more complex model of these relationships.

Our findings suggest that both line managers and occupational health professionals may play different pivotal roles in the development of self-efficacy beliefs associated with increased self-management behaviors at work. Importantly, the findings suggest that occupational health professionals may provide a sole

important function in increasing chronically ill employees confidence in making work adjustments, which in turn affect self-management behaviors. Occupational health professionals are therefore in a key position to deliver not only health promotion and health interventions to employees, but to also educate employees on how they can manage or adjust their work environment to suit their needs, while remaining productive. In contrast, line managers provide a multi-functional role whereby they are in a prime position to provide both direct support to employees, but to also increase employees' confidence in the different types of behaviors required to effectively manage their illness at work. It is widely recognised that while line managers are an important source of support for employees [e.g. 33, 34, 48] and this study lends further support to include advice, guidance and training to line managers in managing and supporting those employees with a chronic health condition to ensure that they can maintain effective employment [49]. Future studies could introduce and evaluate training interventions for line managers in delivering strategic support to employees with chronic health conditions. In essence, the central role of self-efficacy in prediction of self-management behaviors, and the relationship between employer support and self-management behaviors, suggests that enhancing people's sense of self-efficacy for managing illness in the workplace should be one of the essential components of self-management interventions. Therefore any occupational health-led workplace intervention programme should not only focus on helping employees adapt to their illness within the workplace, but to also increase motivation and confidence in their self-management skills. These important behavioral determinants will not only improve health, but also emotional and functional outcomes [50]. Behavioral interventions can be low-intensity, delivered in groups or individually (according to employees needs and current motivations) using

a range of educational programs and levels of support (for example by introducing employee-led advocacy groups). There are a number of health care and community-led self-management interventions for patients that could be translated into the workplace (for example, supporting strategies used to gain underlying control of the condition). Future research should focus on introducing and testing the effectiveness of these various chronic health conditions workplace management interventions.

Overall, the results of our study indicate that line managers play a vital role in providing support both directly and through increasing self-efficacy, to employees managing a chronic illness. In contrast, occupational health professionals provide indirect support to employees by increasing their self-efficacy in making work adjustments in order to manage their chronic illness. Longitudinal research and intervention studies are required to test these relationships further.

### **Acknowledgements**

This work was supported by a grant from the European Social Fund. We would like to thank participating organizations for access to their workplaces and employees.

Ethical Approval was granted by the University of Nottingham Ethics Committee.

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Table 1: Demographic characteristics across the different chronic illness groups

Variable	Musculoskeletal Pain (MSP)	Arthritis & Rheumatism	Asthma	Depression & Anxiety	Heart Disease	Diabetes	<i>p</i> value <sup>1</sup>
	( <i>N</i> = 230)	( <i>N</i> = 132)	( <i>N</i> = 129)	( <i>N</i> = 121)	( <i>N</i> = 80)	( <i>N</i> = 80)	
	<i>M</i> ( <i>SD</i> )	<i>M</i> ( <i>SD</i> )	<i>M</i> ( <i>SD</i> )	<i>M</i> ( <i>SD</i> )	<i>M</i> ( <i>SD</i> )	<i>M</i> ( <i>SD</i> )	
Age (years)	44.67 <sup>a</sup> (8.83)	50.10 <sup>b</sup> (7.48)	43.53 <sup>a</sup> (10.92)	44.15 <sup>a</sup> (9.04)	50.65 <sup>b</sup> (7.32)	48.58 <sup>b</sup> (7.47)	<.0001
Tenure (years)	13.02 (9.52)	14.54 (8.92)	11.67 <sup>a</sup> (10.13)	12.38 (9.56)	16.39 <sup>b</sup> (9.91)	15.38 (9.09)	<.004
Occupational group	3.88 (1.56)	4.30 (1.75)	3.68 (1.47)	4.16 (1.76)	3.69 (1.61)	3.81 (1.68)	ns
Education	3.41 (1.62)	2.94 (1.72)	3.29 (1.72)	3.70 (1.70)	3.23 (1.58)	3.26 (1.65)	ns
Gender	<i>N</i> (%)	<i>N</i> (%)	<i>N</i> (%)	<i>N</i> (%)	<i>N</i> (%)	<i>N</i> (%)	
Male	111 (48.9)	45 (34.1)	62 (48.1)	54 (44.6)	58 (72.5)	46 (57.5)	<.0001
Female	116 (51.1)	87 (65.9)	67 (51.9)	67 (55.4)	22 (27.5)	34 (42.5)	
Severity							
Mild	103 (45.4)	49 (37.4)	87 (68.0)	50 (42.0)	50 (67.6)	61 (81.3)	<.0001
Moderate	80 (35.2)	58 (44.3)	29 (22.7)	45 (37.8)	18 (24.3)	11 (14.7)	
Severe	44 (19.4)	24 (18.3)	12 (9.4)	24 (20.2)	6 (8.1)	3 (4.0)	

<sup>1</sup> P values for ANOVA and Chi<sup>2</sup> analyses (gender and severity of illness). For each row with superscripts, means with superscripts <sup>a</sup> differ significantly from means with superscripts <sup>b</sup>. Games Howell test for unequal variances was used for all post hoc comparisons with ANOVA (*p*<.01).

Table 2: Means and standard deviations on measures of self-efficacy and self-management behaviors for the different chronic illness groups

Variable	Musculoskeletal Pain (MSP)	Arthritis & Rheumatism	Asthma	Depression & Anxiety	Heart Disease	Diabetes	<i>p</i> value <sup>1</sup>
	( <i>N</i> = 230)	( <i>N</i> = 132)	( <i>N</i> = 129)	( <i>N</i> = 121)	( <i>N</i> = 80)	( <i>N</i> = 80)	
	<i>M</i> ( <i>SD</i> )	<i>M</i> ( <i>SD</i> )	<i>M</i> ( <i>SD</i> )	<i>M</i> ( <i>SD</i> )	<i>M</i> ( <i>SD</i> )	<i>M</i> ( <i>SD</i> )	
<i>Self-efficacy</i>							
Medication	<sup>b</sup> 7.20 (2.82)	<sup>b</sup> 8.22 (1.98)	<sup>a</sup> 9.10 (1.10)	<sup>b</sup> 7.44 (3.03)	<sup>a</sup> 9.45 (0.82)	<sup>a</sup> 8.87 (1.27)	<.0001
Symptoms	<sup>b</sup> 5.62 (2.28)	<sup>b</sup> 5.86 (2.50)	<sup>b</sup> 7.61 (2.34)	<sup>a</sup> 4.95 (2.22)	<sup>b</sup> 8.11 (1.37)	<sup>b</sup> 7.60 (2.15)	<.0001
Work adjustments	<sup>b</sup> 6.16 (2.56)	<sup>b</sup> 6.24 (2.91)	<sup>b</sup> 6.55 (2.80)	<sup>a</sup> 4.67 (2.52)	<sup>b</sup> 6.96 (2.77)	<sup>b</sup> 6.93 (2.59)	<.0001
<i>Self-management</i>							
Medication	<sup>b</sup> 7.20 (2.82)	<sup>b</sup> 8.22 (1.99)	<sup>a</sup> 9.10 (1.10)	<sup>b</sup> 7.44 (3.03)	<sup>a</sup> 9.45 (.82)	<sup>a</sup> 8.87 (1.27)	<.01
Symptom	6.23 (2.84)	6.83 (2.96)	6.89 (3.06)	6.53 (2.90)	6.51 (3.23)	6.70 (3.01)	ns

For each row with superscripts, means with superscripts <sup>a</sup> differ significantly from means with superscripts <sup>b</sup> (Games Howell post hoc comparisons, adjusted *p*<.0001).

<sup>+</sup> ANCOVAs carried out using transformed dependent variables as described in Table 3. Means and standard deviations reported are from untransformed data.

Table 3: Correlations among the Key variables

	1	2	3	4	5	6	7	8	9	10	11	12	13
<b>Demographic variables</b>													
1. Gender	-												
2. Age	-.03	-											
3. Education level	.04	-.15**	-										
4. Tenure (years)	-.18**	.42**	-.22**	-									
5. Number of years with chronic illness <sup>a</sup>	.01	-.01	.12**	-.01	-								
6. Illness severity	.08	.01	-.14**	.04	.06	-							
<b>Self-efficacy scales</b>													
7. Medication management <sup>b</sup>	-.01	-.11**	-.04	-.03	-.09	.16**	-						
8. Symptom management	-.06	.08*	.03	-.06	.14**	-.30**	-.48**	-					
9. Work adjustment	.06	.09*	.04	-.04	.10	-.17**	-.40**	.61**	-				
<b>Support</b>													
10. Line manager	.18**	.10*	-.02	-.03	.01	.04	-.19**	.17**	.39**	-			
11. Occupational health	-.16**	-.02	-.09*	.07	-.10**	.09	-.10*	.08	.22**	.41**	-		
<b>Dependent variables</b>													
12. Self-management of symptoms	.04	.09*	-.06	.02	-.02	.04	-.33**	.19**	.32**	.23**	.15**	-	
13. Self-management of medication <sup>b</sup>	-.01	-.23**	-.02	-.10*	.01	.06**	.49**	-.27**	-.28**	-.20**	-.13**	-.42**	-
Mean (SD) <sup>c</sup>	.51 (.50)	46.36 (9.17)	3.32 (1.68)	13.55 (9.71)	11.17 (10.46)	1.66 (0.74)	8.21 (2.31)	6.38 (2.48)	6.17 (2.77)	3.49 (2.51)	3.05 (2.64)	6.57 (2.97)	7.80 (2.85)
N	769	759	748	762	756	736	681	664	708	679	611	643	575

a. variable transformed using Log10 transformation.

b. variable transformed using Log10 (k-x) transformation (variable is inverted).

c. Result calculated from non-transformed data

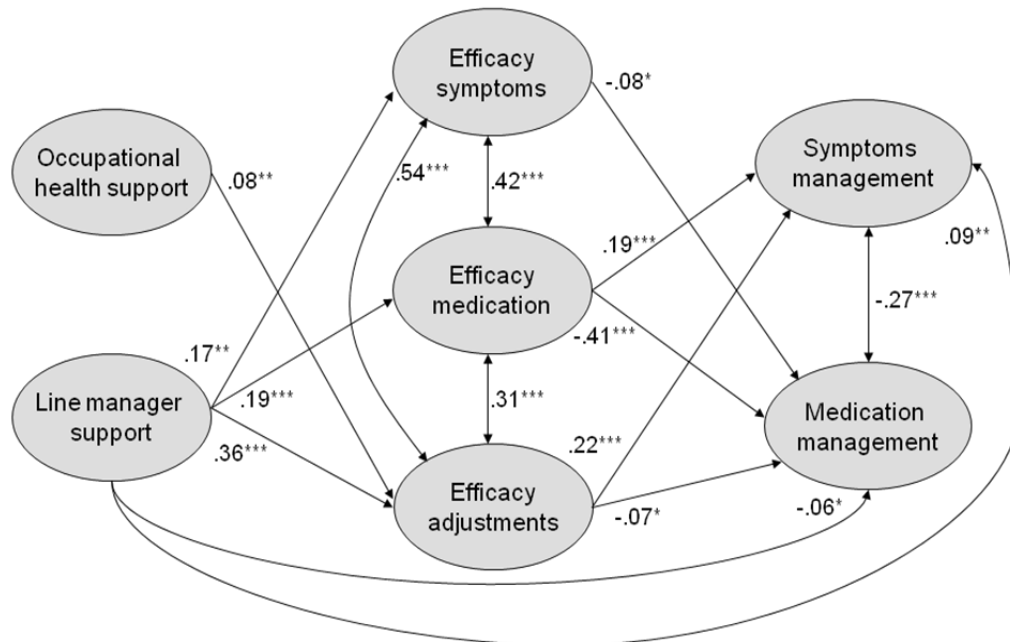
\*\*P<.01; \*P<.05

Table 4  
Fit Indices for Nested Sequence of Mediation Models

Model	$\chi^2$	df	NNFI	CFI	AGFI	RMSEA
Efficacy as mediator						
Direct paths model (M0)	182.41	1	.60	.60	.23	.40
Full mediation model (M1)	14.32	4	.98	1.00	.98	.05
Part mediation model (M2): occupational health support and symptom management	11.66	3	.97	1.00	.97	.05
Part mediation model (M3): occupational health and medication management	11.52	3	.97	1.00	.97	.05
Part mediation model: line manager support and management symptoms (M4)	2.29	3	.100	1.00	.99	.00
Part mediation model: line manager support and medication management (M5)	3.68	2	.99	1.00	.99	.02

Note. NNFI = nonnormed fit index; AGFI = adjusted goodness of fit index, CFI = comparative fit index; RMSEA = root-mean-square error of approximation.

Figure 1: Self-efficacy as mediator: M5



$p^* < .05$ ,  $** < .01$ ,  $*** < .001$ . Only significant paths are presented in this figure