



Predictors of a successful implementation of an ergonomic training program

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ABSTRACT

Job, organizational and individual predictors of a successful implementation of an ergonomic training program were evaluated in a single-case study. The conceptual model of learning transfer of Baldwin and Ford (1988) was adapted for an ergonomic context. 116 employees in a large production company underwent a comprehensive ergonomic training. Transfer of training into practice was measured by the number of ergonomic improvements which were realized in the company in the years after the training. Job, organizational and individual variables explained 35% of the variance of learning transfer in to the organization. Psycho-social resistance attitudes and management support were found to be the most important predictors of implementation failure and success.

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1. Introduction

Ergonomic training programs offered for all employees within an organization are a recommend method to implement ergonomic measures in a participatory ergonomics approach (e.g., Haines et al., 2002; King, 1995; Loisel et al., 2001; Noro and Imada, 1991; Wilson et al., 1995; Wilson and Haines, 2005). Participatory ergonomic training programs are intended not only to educate, but also to involve employees in the recognition, reporting, analysis and resolution of ergonomics problems (King et al., 1997). Such programs may not only help to improve the quality of the working conditions, but also help to reduce injuries and accidents (for an estimation of the costs of work-related injuries and illnesses, see Koningsveldt, 2000). Because the development and realization of a comprehensive participatory ergonomic training program is a costly investment for management, the success of such a program should also be evaluated.

In this study we present the results of a systematic evaluation of an implementation of a participatory ergonomic training program in a medical-technical production company. The study is based on Baldwin and Ford's (1988) well-received model of learning transfer and integrates further developments of the model (e.g., Burke and Hutchins, 2007). Learning transfer is defined as the degree to which trainees effectively apply the knowledge, skills and attitudes gained in an (ergonomic) training context to the job (Wexley and Latham, 1981). Although the transfer of training research literature has

increased over the past decade, only few studies have examined transfer of an ergonomic training at the organizational level (e.g., King et al., 1997; Robertson et al., 2009). In general, although the literature continues to report a transfer problem in organizations, little attempt has been made to examine what organizations could do to improve transfer (Saks and Belcourt, 2006).

The goal of this study is the evaluation of the implementation of a participatory ergonomic training initiative in a single-case study. Based on the model framework, both the model predictors and the target variable (learning transfer) were adapted to the ergonomic contents of the training program. The study combines a test of the transfer model with an evaluation approach. A practical goal of the study for the organization was a further improvement of the learning transfer of the newly developed ergonomic training program.

2. Study background

2.1. Learning transfer

The learning transfer literature has a heterogeneous research tradition. Study results are not easy to compare because there are no uniform criteria for evaluation (Baldwin, 1992; Baldwin and Ford, 1988; Burke and Hutchins, 2007; Burke et al., 2006; Cheng and Ho, 2001; Ford and Weissbein, 1997). A criterion measure often used in many studies is the retention of the learned material, measured with written tests, where trainees or outsiders are asked to recall trained material immediately or shortly after completion of the training program. Other studies report the percentage of the transferred learning knowledge. Results in these studies differ

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widely, ranging from 10% to 15% (Baldwin and Ford, 1988; Burke and Baldwin, 1999) up to 58% (Olsen, 1998). The percentage of persons who transferred their knowledge and skills into the work is another measurement of learning transfer. For example, Huczynski and Lewis (1980) divided trainees into two groups based on the fact whether trainees' had attempted to transfer their learning or whether they had not. The results indicate that only 35% of the trainees had attempted to transfer what they had learned to their job. Baumgartel et al. (1984) evaluated the effectiveness of different management development programs. Respondents were asked to describe what efforts the trainees had made after the training to apply what they had been learned. In this study, only about 50% of the respondents reported any significant attempt to apply new knowledge to the job (Baumgartel et al., 1984). Saks and Belcourt (2006) asked members of a large training and development society in Canada to indicate the percentage of employees in their organization that effectively applied and made use of what they had learned in training programs on the job at three subsequent time periods. The results indicated that, respectively, 62%, 44%, and 34% of employees transfer their skills immediately, six months, and one year after training (Saks and Belcourt, 2006). There are numerous reasons for the widely differing results on learning transfer. Learning transfer depends not only on the training content, the work environment, and personal characteristics of the trainees (Burke and Hutchins, 2007), but also, as mentioned above, on the measurement of learning transfer, ranging from subjective trainees' perceptions of knowledge to (objective) observation of activities resulting from the training. In their meta-analysis, the authors recommend that future studies should directly assess *transfer into the organization* (i.e. transfer from knowledge into action) as an outcome variable of training evaluation studies (Burke and Hutchins, 2007).

As a main result of a meta-analysis analyzing the relative effectiveness of worker safety and health training methods, Burke et al. (2006) found that if training methods become more engaging, workers demonstrated not only a greater knowledge after the training, but there is also a decrease in accidents and injuries observable. Positive effects on safety behavior and health are some of the most important training outcomes in ergonomic training programs. In ergonomics training programs, the number of ergonomic interventions, evaluated by external experts after the training program, is a highly relevant learning transfer outcome from an organizational perspective (e.g., Montreuil et al., 2006).

2.2. Predictors of learning transfer

2.2.1. The training content

A large proportion of the empirical research on learning transfer has concentrated on improving the design of training programs. A systematic analysis of needs, the inclusion of stakeholders in the design of the training and a clear definition of learning goals are preconditions for designing a successful training (Burke and Hutchins, 2007). The most commonly described training content deficits leading to a reduced transfer include limited opportunities to apply learned knowledge to their work, the lack of direct relationship to their work, and the lack of understanding of the content (Lim and Johnson, 2002). Training material which is too theoretical may also inhibit transfer of training (Foxon, 1993). Furthermore, the training content needs to be closely relevant to the transfer task (Bates, 2003). Thus, a positive correlation between the perceived usefulness of the training contents and the learning transfer is often observed (e.g., Gallenberger and Masuhr, 2005). This indicates that the practical relevance of the training contents, the inclusion of job-related problems, and recognition of abilities to transfer are of great importance for applications of the skills (see also Kogi, 1997).

Results of the meta-analysis of Burke et al. (2006), analyzing worker safety and health training methods, shows that trainings involving behavioral modeling, practice and dialogue show the highest amount of learning transfer. In their comprehensive literature review, Burke and Hutchins (2007) mention the following training strategies as particularly useful to enhance learning transfer: Practice and feedback during the training, over-learning, especially for skills that may go unused for long time intervals, active learning strategies, and behavioral modeling.

A participatory ergonomics training approach typically consists of a training phase where a group of employees is advised by technical experts. After the training phase, these employees develop ergonomic improvement measures with their coworkers (e.g., Robertson et al., 2002). Such an approach offers continuous feedback during the training, includes behavioral modeling elements and, by involving the trainees, includes also practice and dialogue aspects (King, 1995; King et al., 1997). Since such an approach fulfills most of the criteria described as successful in the meta analyses, a high learning transfer, i.e. a transfer of ergonomic improvement measures in the organization, could be expected.

2.2.2. The work environment

Elements of the training- and the post-training environment can encourage (e.g., rewards, job aids), discourage (e.g., ridicule from peers), or prohibit the application of new skills and knowledge on the job (e.g., lack of necessary equipment) (Tannenbaum and Yukl, 1992).

Of particular importance is the change climate of the organization and the extent to which the social context (supervisors, co-workers) of the work setting provides reinforcement and feedback (Noe and Schmitt, 1986). The trainees' perceptions of a work environment which support changes influence not only the motivation to learn within the training phase but also the perceived ability to transfer skills from the training situation to the work setting. Baumgartel et al. (1984) examined the role of organizational climate in moderating the outcomes of management training. They showed that the work environment into which a previously trained manager is moving affects the extent to which they apply new learning on the job. The most favorable organizational climate is characterized by freedom to plan and to set personal performance goals, a rational evaluation and reward system, and openness in inter-personal relationships. Tracey et al. (1995) also examined an organization's climate for transfer, which refers to trainee's perceptions about characteristics of the work environment (adequate resources, opportunities to use skills, feedback, favorable consequences for using training content). It was found that perceptions of such a climate predicted the extent to which employees engaged in trained behavior on the job.

The successful implementation of training contents often fails because persons who are involved in the transfer process resist to change and insist on habits (Lemke, 1995). Psycho-social resistance is a multidimensional construct which contains different inhibiting factors of work environment such as little cooperation and support from the organization level, the supervisor and peers (Buchhester, 2003). For example, Chiaburu and Marinova (2005) examined the predictors of skill transfer in their exploratory study. Trainees who reported receiving high levels of organizational, supervisor, and peer support, and who also participated in a peer support network, reported higher levels of transfer of knowledge and skills (Cromwell and Kolb, 2004). A non-supportive social work setting will inhibit the use of knowledge and skills acquired in training (Noe and Schmitt, 1986), whereas a supportive work environment increases the effectiveness of training measures (Richman-Hirsch, 2001).

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