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# When is job rotation perceived useful and easy to use to prevent work-related musculoskeletal complaints?

Priscilla C. Leider [a], Julitta S. Boschman [a], Monique H.W. Frings-Dresen [a], Henk F. van der Molen [a, b, *]

[a] Coronel Institute of Occupational Health, Academic Medical Center, University of Amsterdam, Amsterdam, The Netherlands
[b] Arbouw, Dutch Health & Safety Institute Construction Industry, Harderwijk, The Netherlands

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ABSTRACT

Job rotation is often recommended to optimize physical work demands and prevent work-related musculoskeletal complaints, but little is known about possible facilitators and barriers to its usefulness and ease of use. Following a qualitative research design, semi-structured interviews with employers (n = 12) and workers (n = 11) from the construction industry were conducted. Organizational climate, job autonomy, job characteristics and work processes were mentioned as either facilitators or barriers on an organizational level. Worker characteristics, work behavior and attitude were mentioned as either facilitators or barriers on an individual level. Following a structured approach to assess usefulness of job rotation to optimize physical work exposures and identifying barriers to usefulness and ease of use in relevant stakeholder groups is necessary in order to select or develop strategies to overcome these barriers, or to reject job rotation as a useful or easy to use intervention in the given context.



## 1. Introduction

Since musculoskeletal complaints contribute to reduced work productivity (Meerding et al., 2005), sick leave (Bergstrom et al., 2007) and early retirement (Van den Berg et al., 2010), there is growing interest for the potential of interventions to prevent musculoskeletal complaints and promote sustainable working life. Job rotation is a commonly used organizational measure for preventing work-related musculoskeletal complaints through changes in physical work exposures (Jorgensen et al., 2005). The principle of job rotation is rotating workers between activities with the purpose of minimizing accumulated exposures on a particular body region (Jonsson, 1988). This may be achieved by following exposure guidelines or, if this is not feasible, by alternating load on different body regions during a workday. However, little is known about job rotation practices. This includes a lack of research on its effects, practical guidance for practitioners and researchers, as well as knowledge about facilitators and barriers to successful implementation.

Application contexts of job rotation are varied. For example, research has been done among meat cutters (Arvidsson et al., 2012), supermarket cashiers (Rissen et al., 2002), refuse collectors (Kuijer et al., 2004) and office workers (Fernström and Aborg, 1999). Most of the field studies on job rotation show inconsistent effects. For instance, studies found rotation to decrease physical workload (Kuijer et al., 1999; Fredriksson et al., 2001; Arvidsson et al., 2012) and physical work demands (Kuijer et al., 2004), but also to increase physical workload (Kuijer et al., 1999). Furthermore, studies found rotation to increase shoulder pain (Rissen et al., 2002), upper extremity complaints (Fredriksson et al., 2001) and low back complaints (Fredriksson et al., 2001; Kuijer et al., 2005), while one study found rotation to decrease upper extremity complaints (Fernström and Aborg, 1999).

Shortcomings in implementation and evaluation of job rotation may partially explain the inconsistent effects on both exposures and musculoskeletal complaints. Often little attention is paid to possible facilitators and barriers to perceived usefulness and ease of use of job rotation in the given context. The modified Technology Acceptance Model (TAM) theorizes that influencing factors on intention to use any technical or organizational measure are mediated by perceived usefulness and ease of use (Aggelidis and

* Corresponding author. Coronel Institute of Occupational Health, Academic Medical Center, University of Amsterdam, PO Box 22660, 1100 DD, Amsterdam, The Netherlands. Tel.: +31 205667857; fax: +31 206977161.
*E-mail address:* h.f.vandermolen@amc.nl (H.F. van der Molen).

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Chatzoglou, 2009). Perceived ease of use also influences perceived usefulness, as the easier a system is to use, the more useful it can be (Venkatesh and Davis, 2000). Also, when attempting to improve health, practitioners often seek to gain acceptance of changes to the workplace or of alternative methods of working (Haslam, 2002). In this study, perceived usefulness is defined as the degree to which someone believes that using job rotation will be effective for the intended purpose (i.e. prevent musculoskeletal complaints or minimize accumulated exposures); perceived ease of use as the degree to which someone believes that job rotation will be easy to apply in the workplace. More insight into the factors that influence perceived usefulness and ease of use of job rotation may contribute to more successful implementation.

Work-related musculoskeletal complaints may be caused or worsened by physical job demands. This is especially true for workers in the construction industry, as they are exposed to high cumulative physical demands and they start working at an early age (approx. 16 years old). This means they will have worked for 50 years when reaching retirement age. In the Netherlands, 72% of construction workers perceived their job as physically demanding, with 38% of workers reporting musculoskeletal complaints (Arbouw, 2014). In addition, back complaints accounted for 43% of all lost workdays in the construction industry in 2011 (Economisch Instituut voor de Bouw, 2011). Elimination of adverse physical work demands is not always feasible for construction trades, so minimizing accumulated exposures through job rotation is often recommended by the Occupational Safety and Health Administration (OSHA) and Health and Safety Executive (HSE) as an alternative to technical measures. In addition, implementing an intervention in the construction industry is considered a challenge (Boschman et al., 2013; Oude Hengel et al., 2011). Therefore, we expect this industry particularly able to provide considerations for researchers and practitioners who are planning to conduct job rotation interventions.

We aim to identify possible facilitators and barriers to perceived usefulness and ease of use of job rotation among workers and employers, since these two key actors have the knowledge and ability to influence both processes and outcomes of an intervention. By using a qualitative approach we addressed the following research questions:

1. What are possible facilitators and barriers to perceived usefulness of job rotation to minimize accumulated exposures, prevent musculoskeletal complaints and promote sustainable working life?
2. What are possible facilitators and barriers to perceived ease of use of job rotation in the construction industry?

## 2. Method

A qualitative research method was used, based on semi-structured face-to-face interviews that aimed to identify possible facilitators and barriers to perceived usefulness of job rotation to minimize accumulated exposures, prevent musculoskeletal complaints and promote sustainable working life and to perceived ease of use of job rotation in the construction industry.

### 2.1. Participants

Interview participants were recruited from different construction organizations using a purposive sampling procedure and snowballing, with variation in trades and organization size as selection criteria. We included employers and workers from three trades: one trade from the building and development industry, one trade from the roads and civil engineering industry and one trade from the finishing and maintenance industry. The trades had to fulfill the following inclusion criteria: (1) there are opportunities for rotation between tasks and/or activities, and (2) the trade has high prevalence of musculoskeletal complaints of specific body regions.

In every trade, we interviewed employers and workers from a small organization (<21 workers), a medium-sized organization (21–100 workers), and a large organization (>100 workers). The three trades included in this study were carpenters (building and development), pavers (roads and civil engineering) and painters (finishing and maintenance).

### 2.2. Procedure

Participants were recruited through several strategies, such as via information leaflet, via telephone, via email and through networking. The first author conducted the interviews (female, 25 years old, MSc), with a maximum duration of 45 min (range 13–43 min) and at a location convenient for the participant, usually an office or worksite. Each interview was audio taped and when the location allowed it additional notes were made. All interviews were conducted October through December 2013. The same interview protocol was used for all participants, but employers and workers were interviewed separately for confidentiality purposes. Incidentally, a team of workers was interviewed together due to time and practical constraints. Before the start of each interview, the interviewer gave a brief explanation about the purpose of the study and some examples to illustrate our definition of job rotation: workers rotating between tasks (combinations of actions comprising functional operations) within a job or between activities (postures and/or movements to perform tasks) as a means to minimize accumulated exposures. We assumed data saturation was achieved when no new facilitators or barriers were cited and expected this to occur after 8–10 interviews per trade.

### 2.3. Interview

The interview questions covered the following topics: (1) facilitators and barriers in the organizational and individual context to perceived usefulness of job rotation to minimize accumulated exposures, prevent musculoskeletal complaints and promote sustainable working life, and (2) facilitators and barriers in the organizational and individual context to perceived ease of use of job rotation in the construction industry. Our interview model was based on the modified 'Technology Acceptance Model' (TAM) from Aggelidis and Chatzoglou (2009); the topics used were perceived usefulness and ease of use in the organizational and individual context. A pilot interview with a carpenter was conducted and feedback was incorporated into the final interview protocol (see appendix interview items).

### 2.4. Data analysis

Audiotapes of the interviews were transcribed verbatim and organized using MAXQDA11, software for qualitative data-analysis. The analysis of the interviews followed a purpose-driven approach, aiming to distinguish all citations relating to our two topics: (1) facilitators and barriers to perceived usefulness of job rotation to minimize accumulated exposures, prevent musculoskeletal complaints and promote sustainable working life, and (2) facilitators and barriers to perceived ease of use of job rotation in the construction industry. First, each interview was open coded. In this inductive step, all examples of facilitators and barriers were highlighted. During the coding procedure, we aimed to be as inclusive as