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Comparative configurational case analysis of ergonomic injuries ☆

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Abstract

This article presents a specific research-design – systematic comparative case analysis – to analyse the impact of organizational characteristics on the occurrence of ergonomic injuries. A systematic comparative case analysis consists of an across case analysis and a within case analysis of a limited set of comparable cases. Across case analysis or qualitative comparative analysis (QCA) aims to identify similarities and differences between configurations of explanatory variables. Within case analysis aims to identify the causal mechanisms which link configurations to outcomes. Systematic comparative case analysis is applied to a research question on the organizational antecedents of repetitive strain injuries of the wrist in highly repetitive, non-fragmented and simple jobs in the assembling, sorting and packaging industry.

Keywords: Qualitative comparative analysis (QCA); Configurational analysis; Causal mechanisms; Case studies; Repetitive strain injuries; Ergonomics; Organization of work

1. Introduction

Many people suffer from ergonomic problems such as repetitive strain injuries (RSI's). Much progress is made in understanding the causes of these problems. Initially, the emphasis in research was on exploring the importance of biomechanical, personal and psychosocial factors (Malchaire, 2001; Malchaire et al., 1997, 2001a,b; Malchiare and Piette, 2002; Stal et al., 1999, 2003; Van der Beek and Frings-dresen, 1998). These factors, however, only explain part of the variance and the bulk of variance in research remains unexplained. As a result, researchers introduce a new set of ecological or organizational variables to explain additional variance with some success (De Jonghe, 1999; Elovainio et al., 2000; Söderfeldt, 1997; Koslowsky, 1998). This set includes factors which relate to the organization of work. The inclusion of these variables resonates with many studies on the relationship between the organization of work and quality of work (Van Hootegem, 2000). How firms organize jobs influences the well-being at work. As a result, recent research into RSI aims to further explore the relationship between the organization of work and the occurrence of RSI by including organizational characteristics in existing models.

However, the expansion of existing explanatory models with organizational characteristics has not yet led to comprehensive models explaining (individual level) outcomes. Moreover, there is only limited knowledge on how organizational characteristics generate health problems such as repetitive strain injuries. Hence, some key-challenges for research remain (see also Cooper et al., 2001). These challenges relate to issues concerning the measurement and impact assessment of organizational characteristics on the one hand and the practical implications of research-results on the other hand. The former relates to questions on how to best measure

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organizational characteristics and how to interpret the effect of organizational characteristics on ergonomic outcomes. The latter refers to issues of the usability of research-results to improve organizational design in order to minimize health problems and the challenge of designing research which comes up with effective solutions. The first part of the article sketches some of these key-challenges more in depth and presents a research-design – systematic comparative case analysis based on the work of Charles C. Ragin (1987, 2000) – which addresses these challenges. This research-design takes the researcher away from explaining individual-level outcomes to identifying organizational characteristics and mechanisms which lead to RSI. A key-aspect of the research-design is that it does not aim to generate a model which fits the data best, but identifies several models and mechanisms which explain a diverse set of comparable cases. This type of analysis can make a fruitful contribution to research on the relationship between organizational design and ergonomic pains. In the second part of the paper the research design is applied to a study of repetitive strain injuries of the wrist (RSIW) in assembly, sorting and packaging jobs. The final part presents a theoretical and methodological discussion of the results. The conclusion discusses the main benefits and drawbacks of the research-design.

2. Challenges for research

One can identify at least two challenges for research on the relationship between organizational design and ergonomic outcomes. A first challenge is to develop theories of causation that integrate micro-and macro-level variables and explain these relationships across levels (Diez-Roux, 1998; Blakely and Woodward, 1999). Questions such as how individuals interact with the organizational context and how organizational structures influence individual behaviour are crucial. The 'social mechanisms school', which originates out the middle-range school (Merton, 1968) basically argues for a research strategy which aims to uncover the many social mechanisms which influence human behaviour (Coleman, 1990; Granovetter, 1985; Schelling, 1978; Hedstrom and Swedberg, 1998). According to this school there are many different micro–macro–micro mechanisms influencing human behaviour. A thorough understanding of these mechanisms is important to understand different relevant outcomes such as health consequences of organizational design. This is basically a question for in-depth/qualitative-oriented research into specific cases and specific mechanisms. Quantitative research clarifies which correlations/associations are interesting for investigation, but not how specific outcomes are generated. In other words, information on causal processes and mechanisms is crucial to understand how organizational characteristics influence human behaviour and in turn contribute to the presence or absence of ergonomic injuries.

Secondly, some authors argue that it is unfortunate that existing models only explain a limited proportion of the variance of an important contemporary health problems. As a result, research offers relatively little in terms of solving the problem and has little practical importance (Van Veldhoven et al., 2002). Hence, the second challenge is to make research-results more applicable. This requires a move away from probabilistic explanations of a large set of cases to a more focused explanation of a limited set of cases. Hence, research should generate conclusions which are open to experimentation in terms of organizational design.

3. Research design: Systematic comparative case research

Given these challenges, how can one proceed? A systematic comparison of a limited set of multiple cases is an appropriate research design to start to address these challenges. This research design builds on the pioneering work of Charles Ragin (1987, 1994, 2000, 2003) who develops the comparative method and specific analytic techniques to compare cases (Qualitative Comparative Analysis (QCA)). The QCA approach is expanded by including within-case analysis to identify causal mechanisms which generate an outcome (Bennett and George, 2005; Brady and Collier, 2005). This research strategy allows researchers to gain an in-depth knowledge of cases which, in turn, allows researchers to assess the comparability of cases.

This research strategy implies a change in unit of analysis and basic research question for ergonomic research. The unit of analysis is the type of work organization (job) and the basic research question is: do some forms of work organization generate higher incidences of ergonomic outcomes than others? Before an application of the research-design is presented the next paragraphs discuss the meaning of each important concept of the research design, namely case, comparative and systematic.

It is a case approach which implies that each individual case is considered as a complex entity (configuration of variables) which needs to be analyzed as such (Ragin and Becker, 1992; Ragin, 1987, 2000). Different parts of each case are understood in relation to one another and in terms of the total picture that they form together. The basic idea is that cases constitute a whole and should be comprehended as such. For example, the organization of work is a configuration of different aspects such as the ability to insert breaks or the interdependence with other workers. The organization of work cannot be characterised by each aspect separately, but by a configuration of different aspects. This research-strategy starts from the assumption that in order to find out why some forms of work organization generate more pains than others, one has to understand the case–work organization — as a whole. The essence of case analysis is to understand the configuration of variables and how that configuration is generates an outcome. In this way, this approach resembles more qualitative-oriented case research than quantitative-oriented variable research.

Secondly, the study is comparative in the sense that it explores similarities and differences across cases by comparing configurations. The goal is to unravel the different causal variables connected to different outcomes — causal patterns that separate cases into different subgroups. Generally, researchers