

# Chapter 77

## Individual Risk Assessment (ERIN): Method for the Assessment of Workplace Risks for Work-Related Musculoskeletal Disorders

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### **ABSTRACT**

*Work-related musculoskeletal disorders (WMSDs) prevention has become a global phenomenon and nowadays is one of the main challenges that ergonomics and work safety professionals face. The evaluation of risk factors exposition related to the WMSDs is one of the main activities that are performed for prevention. In order to accomplish it, many ergonomic assessment methods have been developed. In this chapter, an ergonomic observational individual risk assessment (ERIN) method is presented, which is distinguished for being easy to learn, apply, and it needs short training time. Results on the reliability, validity, and usability studies of ERIN are included too, as well as an example of how it can be used in the workplace intervention process.*

### **INTRODUCTION**

Work-Related Musculoskeletal Disorders (WMSDs) prevention has become one of the main focus to the Ergonomics and Occupational Safety and Health fields. It is accepted and acknowledged that these diseases emergence is due to the existence of workstations/tasks that do not meet ergonomic principles, exposing workers to risk factors related to these diseases (NIOSH, 1997). On consequence, from a few years ago, many professionals and researchers have been interested in refining the evaluation of the exposure to risk factors related to the WMSDs, resulting in the creation of new methods/tools and the update of some existent ones (Takala et al., 2010). These can be grouped into three fundamental cat-

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### ***Individual Risk Assessment (ERIN)***

egories: direct measurement, self-report and observational (S. Bao, Howard, Spielholz, & Silverstein, 2007; David, 2005; ISO 11228-3, 2007; Li & Buckle, 1999; Neumann, 2006).

Direct measurement methods usually use sensors placed over the individual's body (electrogoniometers, inclinometers, lumbar motion monitor, among others), and they offer a high accuracy on the measures if used correctly (Stephen Bao, Howard, Spielholz, Silverstein, & Polissar, 2009; N. Corlett, 1995; David, 2005; Li & Buckle, 1999). They are used for simulated tasks study and allow registering body coordinates in real time with high precision. As the main disadvantage, it can be mentioned that the sensors placed on the subject's body can cause discomfort and changes in its behavior, it requires time for the analysis and data interpretation, instrument calibration and workgroups with high qualification and experience. Due to technological limitations, such as the number of entry channels available on an instrument and its space for information storage, these methods are usually limited to evaluate a reduced number of people and body parts (Stephen Bao et al., 2009). Furthermore, the main disadvantage is that the related costs to direct measurement are usually very high, which makes them unpractical in large epidemiological studies on WMSDs or for most ergonomics internships.

Other advanced measure techniques have been developed for posture variation analysis on highly dynamic activities. For this, information is registered as from filming the individual on real time for a representative work time lapse, registering relevant information for its later analysis on specific programs. The analysis can include the use of biomechanical models that use anthropometric and posture information and manipulated load to calculate the momentum and forces between the body segments. The complexity of these models varies from static dimensions to dynamic tridimensional. These techniques are very expensive, require of highly qualified personnel, and are mostly used for workstation and objects design (cars, machinery, plane cabins, etc.), they do not have a practical usage for evaluating existing workstations and are better for the analysis of simulated tasks (Bubb et al., 2006; Chang & Wang, 2007).

Self-report methods are used to collect data on the exposure to physical and psychosocial factor on the workstation, these include work diaries, interviews, and questionnaires (Neville Anthony Stanton, Hedge, Brookhuis, Salas, & Hendrick, 2004), in which the usage of human body maps and varied punctuation scale are frequently used (E. N. Corlett & Bishop, 1976; Sinclair, 1995; Straker, 1999). These methods have the apparent advantage of easy usage, applicable to a broad spectrum of work situations and allowance to show large samples at relatively low costs. As the main disadvantage, it can be mentioned the necessity of large amounts of samples to achieve representativity and that the information obtained through the worker's perception is generally imprecise and unreliable (David, 2005), this approach of self-report has proven to have low validity and reliability levels related to the ergonomic interventions necessities (Li & Buckle, 1999). Nonetheless, ergonomics practitioners frequently use these types of methods on workplace assessments, given the apparent mentioned advantages.

On the other hand, observational methods are of practical use on a broad range of workstations, allow the study of large samples at relatively low costs and their usage usually does not require interrupting work. As main disadvantages, it could be mentioned that score systems are hypothetical, require knowledge and experience from the observer and the possibility of its bias when the evaluation is being executed. Observational methods have been considered a practical tool with a reasonable reliability among epidemiological investigations on WMSDs, for which they have gained popularity amongst safety and health professionals, since they respond better than direct methods and the self-report ones, which usually require time and limited resources and are in need of guides and intervention priority criteria settling (David, 2005; Takala et al., 2010).

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