

Characteristics and Criteria of Observational Methods for Biomechanical Exposure Assessment in the Workplace: How to Choose the Best with Moderate to High Quality of Evidence

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Abstract:

Observational methods are widely used for biomechanical exposure assessment in the workplace; however, substantial differences in their characteristics and evaluated criteria may lead to inadequate method selection and misinterpretation of occupational risk. Understanding how these methods differ, particularly among those supported by moderate to high-quality evidence, is essential for evidence-based decision-making in ergonomic assessment. This descriptive and analytical study examined the characteristics and criteria of observational methods to support the selection of methods for biomechanical exposure assessment in the workplace. The study was developed as an in-depth methodological analysis based on a previously published systematic review in *Ergonomics* (Valentim et al., 2025), which identified observational methods with moderate to high quality of evidence for their measurement properties according to the COSMIN initiative. Twelve observational methods were identified and analyzed in depth by three experienced evaluators. Data extraction included task specificity, main working postures, biomechanical exposure factors, evaluated body segments, exposure dimensions (frequency, intensity, and magnitude), and the relative influence of each criterion on partial and final exposure scores. The observational methods showed marked heterogeneity regarding purpose, analytical structure, and emphasis of criteria. Joint position and movement/amplitude were the most frequently evaluated exposure factors, whereas physical effort, vibration, and contact stress were less consistently addressed. Trunk, shoulder, and wrist were the body segments that most influenced exposure classification. The European Assembly Worksheet (EAWS) was the most comprehensive method, evaluating the highest number of

biomechanical exposure factors and all exposure dimensions. These findings provide practical guidance for selecting methods based on task demands, body segments of interest, and analytical focus, contributing to more accurate and evidence-based biomechanical exposure assessment in occupational settings

Keywords:

Biomechanical exposure, Observational methods, Ergonomics, Occupational health.