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## Veronesi index of ergonomic risk for activities repetitive of members upper limbs

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### Abstract

**Introduction:** Many authors in their studies, report that repetitive activities are effective causes of the emergence of occupational diseases. Repetitive movements can often bring risk of injury, as the number of movements increases and / or the cycle time decreases. **Objectives:** To evaluate the reliability of the REE-ARMS tool compared with the OCRA tool for ergonomic risk analysis. **Materials and Methods:** The IVRE-ARMS tool was created based on the following existing tools: Ochre Index, Rula, Reba, Moore and Garg and Tor-Tom, in addition to ISO 31000, ISO 11226 and ISO 11228-3. The research was given by a cross-sectional study, which analyzed 134 jobs, refrigerated poultry activities (55 posts) and pigs (60 posts) and banking activities (19 posts), all were applied the OCRA and IVRE- tools ARMS. **Results:** The Kendall tau test showed that there is a high statistical correlation between the OCRA and IVRE-ARMS tools, showing the reliability of the new tool. **Conclusion:** The IVRE-ARMS tool has been validated scientifically compared with the OCRA. This new tool provides the evaluator have multiple analysis of data, and the biomechanical also analyzed by OCRA, analyzes the organizational part, cognitive and biomechanics, stratifies the upper limb in shoulder, elbow and wrist. Thus this new tool enriches the ergonomic analysis and generating quantitative instrumentation to explore the most needed areas for improvement.

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## 1. Introduction

Many authors in their studies, report that repetitive activities are effective causes of the emergence of occupational diseases. Repetitive motions can often pose a risk of injury to measure the number of movements increases and / or decreases the cycle time [1]. Gil (1999) reports that the execution of the same or similar movements quickly and repetitively, are among them physical, biomechanical and organizational factors that involve or develop the work-related diseases (MSDs) and Repetitive Strain Injuries (RSI) [2]. Have Keir [3] showed that factors such as high repetition, high strength and cognitive impacts play a key role in the development of musculoskeletal disorders related to higher end work. In studies of Bosch [4] was demonstrated by electromyography that repetitive activities of short cycles for periods of one hour leads to muscle fatigue and being one of the static load factors. The static load is a continuous force which occurs in the vascular system leading to decreased local vascularization.

The RULA tool (rapid upper limb assessment) considers an activity with more than 4 movements per minute as repetitive [5]. Already the tool OCRA (Occupational Repetitive Actions) considers over 30 technical actions per minute as a repetitive activity. Silverstein [6] says that work activity with duty cycle less than 30 seconds, associated with more than 3000 moves per turn, or when the same muscles are used by more than 50% of the daily time, both are considered to be repetitive activity. The IVRE-ARMS tool, Ergonomic Risk Veronesi Index for upper limbs Repetitive activities was created because of the need to have a tool to analyze the work activity more broadly and from the perspective of physical, cognitive and organizational.

The objective was to create an ergonomic analysis tool, and compare the results with some already validated.

## 2. Materials and methods

This research it is an analytical, cross and quantitative study. The study population were jobs of three distinct activities: 55 poultry slaughtering stations, 60 pig fridge stations and 19 banking activity stations, totaling 134 analyzed positions. In all stations were used as risk analysis method to OCRA and the IVRE-ARMS tool.

### 2.1. Data analysis

Data analysis was performed from the Statistical Package for Social Sciences (version 19.0, SPSS Inc, Chicago). When the raw data of this present study were placed in the statistical program for an initial analysis through the normal proof, this showed that they had a non-normal distribution; therefore, the statistical tests used consisted of non-parametric tests.

To test these hypotheses were made the Wilcoxon test to measure whether there signficativa statistical difference between the tools and the Kendall Tau test ( $\tau$ ) to measure the concordance between the two tools.

This research was given in two stages, first the construction of IVRE-arms tool, after validation thereof.

## 3. IVRE-ARMS tool construction

The IVRE-ARMS tool (Ergonomic Risk Veronesi Index for upper limbs Repetitive activities) was based on the following tools: Ocr Index, Rula, Reba, Moore and Garg, Tor-Tom and Hal, in addition to ISO 31000, ISO 11226 and ISO 11228-3.

The tool was created from a logical mathematical principle within a percentage proportion of all variables within all analyzed items. The items analyzed are: registration (receiving no score, but serves to mathematics guidance of others); organizational variables that consists of 6 and 1 setting; cognitive contained in cognitive aspects of work within and outside work; the biomechanical aspect, the segments of the upper limbs were analyzed separately in order to generate the diagnosis of risk for each. The shoulder has 3 variables and 1 setting; the elbow 2 variables and setting 1 and the handle 3 variables and 1 setting.

The analysis is done by each arm separately, this way was made the following reflection: for a condition without risk (ideal), all variables receive a zero score, where the final score has to be zero, the other conditions receive

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