

Hand Activities and Disorders

Seyedeh Negar Assadi ^{1*}, Ramezan Mirzaei ¹, Habibollah Esmaily ¹

¹ Social Determinants of Health Research Center, Mashhad university of Medical Sciences, Mashhad, Iran

* **Corresponding Author:** Seyedeh Negar Assadi, Social Determinants of Health Research Center, Mashhad university of Medical Sciences, Mashhad, Iran. E-mail: Assadin@mums.ac.ir

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Abstract

Introduction: Hands are involved in the completion of different working activities. Hand activities are of particular importance in occupations where risk factors for occupational disorders, including musculoskeletal disorders, are commonplace among workers. This study aimed to examine hand activities and associated disorders.

Methods: In this study, hand activities and methods for assessing hand activities were identified. The literature, journals, and websites pertaining to the assessment of hand activities were reviewed with a focus on ergonomic factors for human engineering. Harmful activities to the hands and specific evaluation methods were identified. Subsequently, hand disorders were assessed. Data were analyzed with SPSS.

Results: Numerous tests and a checklist were used to evaluate manual activities. Hand disorders included osteoarthritis of hand joints, metacarpophalangeal joints, and finger joints. Other disorders comprised the tendinitis of the hand and finger muscles, as well as the flexor, extensor, and abductor muscles for fingers. Assessment results were satisfactory for the majority of workers.

Conclusion: The best method for assessing hand activity should include both objective and subjective findings. The most effective method for preventing hand disorders is considering subjective complaints and objective findings. In this study, authors found the majority of workers exhibited acceptable assessment results.

Keywords: Occupational Health, Medicine, Diseases, Work

Introduction

Hands are required to perform tasks, and hand activities play a great role in occupations.¹⁻³ Workers are susceptible to occupational disorders such as musculoskeletal disorders due to several risk factors.^{4,5}

Hand activities involve three distinct movements: flexion, extension, and abduction.⁶⁻⁸ Workers with risk factors for hand disorders must be evaluated using hand activity assessment techniques.⁹⁻¹¹ Some of these methods assess the entire body, with a special focus on the upper extremities and hands. Numerous studies have discussed such assessment methods.⁹⁻¹¹

Hand Activity Level (HAL),¹² Manual Task Risk Assessment (Man TRA),¹³ Rapid Upper Limb Assessment (RULA), Rapid Entire Body Assessment (REBA), Rapid Office Strain Assessment (ROSA), Occupational Repetitive Action (OCRA),¹⁴ and Job Strain Index (JSI) are a few of the assessment methods.¹⁵⁻¹⁷

Muscles, tendons, ligaments, and other soft tissues in hands, as well as bones and joints, are affected by occupational musculoskeletal disorders.

Hand disorders will increase if ergonomic factors are not implemented in occupational situations and work settings. Hand osteoarthritis is a musculoskeletal disorder of the hand joints. Tendinitis of the muscles affects the tendons in the hands. These conditions are more prevalent than other disorders in occupational settings. However, non-occupational risk factors must be identified and prevented as well. The identification of these risk factors during preplacement examination is useful and applicable. The purpose of this research was to investigate hand activities and associated disorders.

Materials and Methods

In this study, hand activities and methods for assessing hand activities were identified. Human engineering literature, journals, and websites pertaining to hand activity assessment were reviewed with an emphasis on ergonomic factors. Literature was linked with medicine, occupational medicine, health, and

occupational health. Journals majored in occupational medicine, occupational health, and ergonomic factors. Moreover, the websites were devoted to occupational health, including the international labor organization, occupational health and safety administration, national institute for occupational safety and health, and the World Health Organization.

Some activities were found harmful to the hands, and specific evaluation methods were developed for the hands. Hand activities and disorders were assessed in certain jobs and workers in this study.

Methods for assessing the hand and other organs, both objective and subjective, were researched and listed. The cross-sectional section evaluated workers with repetitive hand actions using HAL and Man TRA methods.

HAL is comprised of two variables: activity continuum and forcefulness, which are measured using the Borg scale. If the total score is less than the TLV or threshold limit value, it is considered acceptable.

Man TRA investigates total time, repetition, exertion, awkwardness, and vibration. Scores for each parameter range from 1 to 5, and a total score below 15 is assumed as acceptable.

The listing of musculoskeletal disorders of the upper limbs and hands was based on references. Workers with hand activity were assessed by hand activity level (HAL) and manual task risk assessment (Man TRA). SPSS was used to assess and analyze the data.

Results

Numerous tests and checklists were used to assess hand activities. Other hand disorders included tendinitis of the hand and finger muscles as well as the flexor, extensor, and abductor muscles for the fingers.

HAL,¹² Man TRA,¹³ RULA, REBA, ROSA, OCRA,¹⁴ and JSI are a few of the methods that can be used to assess strains on the hand.¹⁵⁻¹⁷ Table 1 displays certain hand activity assessment methods.

Hand and upper limb musculoskeletal disorders are diverse and have ergonomic risk factors. Risk factors include force, awkward postures, vibration, repetition, strain, nerve tension and pressure, and blood flow deficiencies and disturbances. Some of the disorders are De Quervain syndrome, Carpal Tunnel Syndrome (CTS), and Hand Arm Vibration Syndrome (HAVS). Hand and upper limb musculoskeletal disorders are listed in Table 2.

Table 1. Hand Activity Assessment Methods

Hand activity assessment method	Hand and other organs assessment methods
Hand Activity Level (HAL)	Manual Task Risk Assessment (Man TRA)
Rapid Office Strain Assessment (ROSA)	Rapid Upper Limb Assessment (RULA)
Occupational Repetitive Action (OCRA)	Rapid Entire Body Assessment (REBA)
Job Strain Index (JSI)	Quick Exposure Check (QEC)

Table 2. Musculoskeletal Disorders of the Hand and Upper Limbs

Musculoskeletal disorders of the hand	Musculoskeletal disorders of upper limbs
De Quervain syndrome	Rotator cuff tendonitis
Carpal Tunnel Syndrome (CTS)	Epicondylitis
Hand Arm Vibration Syndrome (HAVS)	Cubital tunnel syndrome

Discussion

HAL,¹² Man TRA,¹³ RULA, REBA, ROSA, OCRA,¹⁴ JSI, Quick Exposure Check (QEC), and the Ovako Work Posture Assessment (OWAS) are among the numerous assessment methods.¹⁵⁻¹⁷ Some are objective methods, some are subjective methods, and some are both. The term objective refers to the results of an evaluation. Subjective is dependent on and associated with workers' responses.

HAL, for instance, has two variables: activity continuum and forcefulness. Activity continuum is objective, while forcefulness is measured subjectively

using the Borg scale. The Man TRA examines total time, repetition, exertion, awkwardness, and vibration; exertion and vibration are subjectively evaluated, whereas the other variables are assessed objectively. RULA includes objective analyses of posture, muscle use, and force or load. Rapid Whole-Body Assessment (REBA) studies posture, muscle use, and force or load objectively.

ROSA is an objective method that examines a person's sitting posture and computer use. OCRA is concerned with force, frequency of activities, posture, duration, and recovery time of the upper limbs; force is

subjectively evaluated, whereas the other parameters are assessed objectively. JSI examines the intensity, duration, frequency, and speed of hand activities and postures; intensity is studied subjectively, whereas the parameters are assessed objectively. QEC has a checklist and a questionnaire; the checklist is objective, and the questionnaire is subjective.

For measurement and evaluation, objective methods are more useful than subjective ones. In many situations, however, it is necessary to pay attention to subjective complaints, as is the case with occupational musculoskeletal disorders; that is why some methods are both objective and subjective. In many workplaces, disorders could be prevented by considering subjective complaints.

De Quervain syndrome, Carpal tunnel syndrome (CTS), hand-arm vibration syndrome (HAVS), epicondylitis; lateral and medial, tendinitis, rotator cuff tendinitis, cubital tunnel syndrome, ulnar tunnel syndrome, and other disorders are examples of the upper limb and hand disorders.

De Quervain syndrome is a form of tendonitis. The abductor pollicis longus and extensor pollicis brevis tendons become irritated and inflamed as a result of repetitive actions and excessive force. This disorder is linked to handwork in certain occupations with specific risk factors. Ergonomic modifications are beneficial in this situation.³

Carpal tunnel syndrome is a neurological disorder in which the median nerve is irritated by an awkward wrist position, force and pressure on the wrist, repetitive wrist motion, wrist vibration, and cold. It is necessary to distinguish occupational risk factors from non-occupational risk factors. Wrist trauma, edema, diabetes mellitus, rheumatoid arthritis, hypothyroidism, heart failure, and renal diseases are non-occupational risk factors.

Hand-arm vibration syndrome is a disease of the vessels and nerves caused by localized vibration of the upper limbs. Blood supply is stopped, blood vessels are constricted, and the exposed tissues of the fingers degrade. This is a very serious condition. Rotator cuff tendinitis is a shoulder disorder caused by repetitive actions and awkward arm and shoulder postures. In this condition, arm movements are painful and restricted. This disorder is caused by work performed at shoulder height and above. Most of the time, the working height must be near the elbow.

Osteoarthritis is a common condition. It may involve

several joints. It is related to repetitive actions, forces or loads, and awkward postures. Many workers develop it at a young age. Occupational and non-occupational risk factors may contribute to this condition. This disease primarily affects the knee, spine, shoulder, and hand and must be prevented in the early years of employment. The regulation and implementation of ergonomic factors can prevent these disorders. The most important aspect of an ergonomic program is the evaluation of factors using ergonomic methods such as HAL,¹² Man TRA,¹³ RULA, REBA, ROSA, OCRA,¹⁴ JSI, QEC, and OWAS, among others.¹⁵⁻¹⁷

Also essential is the evaluation of musculoskeletal discomfort and symptoms, which can be accomplished using objective and subjective methods.

Due to the fact that all body parts, including the limbs and spine, were evaluated during manual task risk assessment, it follows that these workers' spine and lower limbs were adversely affected, as suggested by the results from Man TRA.

Conclusion

The best approach to evaluating hand activity involves objective and subjective assessments. The most effective method for preventing hand disorders is to pay attention to subjective complaints and objective findings. Moreover, a physical examination is required for the diagnosis of disorders.

Conflict of Interest

The authors declare no conflicts of interest.

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