Chapter 4

Employment of People with Disabilities and Ergonomic Risk Factors at Workplace

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Additional information is available at the end of the chapter

http://dx.doi.org/10.5772/intechopen.76721

Abstract

The importance of employment to people with disabilities has been increasing in recent years. Participation in working life as active producers has been the main factor in community integration of people with disabilities. It has been proven that if people with disabilities are given the opportunity to develop and use their working capacity, they can be as successful as those who do not have any disabilities, and nowadays the most rational way of helping people with disabilities is to provide them with profession and work. Vocational rehabilitation is a process that helps someone to overcome the barriers when beginning to work, continuing to work, or returning to work after any accident, illness, or disorder. Although the employee is selected according to his/her ability according to the work to be done, it is very important that the place to work matches the physical and psychological characteristics of the employee. Ergonomics is important at working life as it affects productivity. Many different ergonomic risk factors are available to affect the quality of life of a person at workplace. This chapter focuses on the employment of people with disabilities, the risk factors they may face at workplace and assessment of risk factors.

Keywords: employment, disability, workplace, ergonomics, risk factors

1. Introduction

Participation of people with disabilities in business life has been increasing in many countries in recent years [1–3]. The use of rehabilitation services and the participation in working life as active producers have been the main factors in community integration of people with disabilities [2–4]. Developed countries make legal arrangements in this area to enable people with disabilities to gain profession. The Americans with Disabilities Act (ADA)

emphasizes that work for people with disabilities is a right, not just a social participation. The United Nations has also taken a major step in recent years, placing 'work' in the basic rights of people with disabilities and obliging employer to prepare accommodation that is compatible with the employee's needs [5].

The International Labour Organization (ILO) states that all persons with disabilities are entitled to vocational rehabilitation, employment and progress at work, regardless of the type of disability and the level of disability [6, 7]. It has been scientifically proven that if people with disabilities are given the opportunity to develop and use their working capacity, they can be as successful as those who do not have any disabilities, and nowadays the most rational way of helping people with disabilities is to provide them with profession and work [1, 4, 6, 8, 9]. Thus, instead of being dependent on others, they will be able to earn an income and perceive themselves as persons who are productive, efficient and economic contributors [2, 3, 6].

The chance of a permanent or temporary physical or psychological discomfort during the life of an employee is 20% [9]. This disturbance can change the functional capacity of the person [9]. An acquired physical disability may cause a person to change jobs or to continue existing work with assistive devices and adaptations [10]. However, it may not always be enough to find a suitable workplace and to adapt the individual to work independently [1]. It is necessary to evaluate the person's ability to continue to work over a long period of time [1]. Some jobs can cause a person's physical condition to deteriorate, which leads to an increase the level of disability both at work and during daily life [1].

People who are permanently or temporarily disappeared from work after a disease or accident can receive financial support for a period of time [9]. Social security institutions, health councils and insurers evaluate the person's functional capacity to determine the person's ability to return to work [9–11]. Job losses due to the loss of working capacity of individuals cause social and economic consequences for both the person and the society [1, 6, 11]. Especially, long-term job losses are costly for countries [1]. Therefore, efforts are being made to minimize the loss of work that can occur through the provision of work security and the measurement of risks [1]. Many countries work on the vocational rehabilitation programs for workers who have lost their working capacity irreversibly, making them to enter the economic arena again [11].

The criteria for returning to work for an employee established by a rehabilitation team in the case of an accident or illness are as follows [9]:

1. Comparison of physical/cognitive requirements of work with function
2. Possible requirements for job modification and settlement
3. Adaptive device or assistive technology requirement
4. Permission for body mechanic training or treatment
5. The need to return to part-time or gradually work within a limited time

http://dx.doi.org/10.5772/intechopen.76721

The above factors are agreed with the employer and the employee to form the action plan. This is a dynamic planner that can be changed according to the progress. The plan can continue until he or she returns to work [9].

2. Employment of people with disabilities

2.1. Barriers to employment of people with disabilities

There are personal and programmed facilitators and barriers in the participation of people with disabilities in their working life [12, 13]. The interaction between these facilitators and barriers constitutes the personal economy of energy and resource [12, 13]. As the barriers increase, the resources within the personal economy decrease [12]. The person should either give decreasing personal source to work or transfer the source into family and social life [12, 13].

The personal factors that are barriers to the working life of people with disabilities are secondary conditions such as pain, fatigue, mobility change, depression, change in perception [12, 14], change in vision, change in bowel and bladder control [12]. Personal factors which are related to disability or not, such as education level, social support status and self-esteem, may also be barriers [6, 13, 14]. People with disabilities who return home without working have stated that secondary conditions have worsened; that no energy is left to participate in the family and social life; that they are stuck between work, financial income and health status; and that they lose from non-work-related quality of life [13, 15, 16]. As a result, the interaction of these secondary conditions with social and environmental barriers negatively affects the economy.

Social and environmental factors alone can also be barriers to the working lives of people with disabilities [6, 12]. Factors such as the lack of a general healthcare coverage and the inability to transfer one's health coverage when going into another work are social barriers [12]. As environmental factors, we can count the barriers when reaching the workplace and all the barriers that prevent mobility at workplace [13]. Inaccessible toilets, pavements and unreachable computer tables are among the environmental barriers [6, 12–14].

It is very important that a person with a disability is able to continue to work or to arrange a suitable place for a new job. In each country, compulsory laws must be enforced to plan and implement a suitable settlement for the employee's needs. Thus, the barriers that may arise in the working life should be tried to be reduced to a minimum. Such problems in the employment of people with disabilities are accompanied by the risk of social exclusion and poverty [6]. Resolving the problems in employment helps participation of disabled people and their families in productive life, as well as it is the only way to increase independence and quality of life [6].

2.2. The importance of vocational rehabilitation in people with disabilities

Vocational rehabilitation is a process that helps someone to overcome the barriers when beginning to work, continuing to work, or returning to work after any accident, illness, or disorder [6, 11]. This process consists of a flexible set of applications that takes shape from

one step to the next according to the needs of the individual [12]. These practices are a very important step for participation in social life again for people with disabilities who have not been able to enter the education system for various reasons; who are disconnected from this system at any stage, disabled while working; or who want to change their occupation [6]. Vocational rehabilitation practices involving individuals who lose their jobs, employers, family members and related persons cover procedures that can help them to easily reach and continue these programs.

In vocational rehabilitation, the person's disability, cause, nature and age do not matter [6]. What is important is whether the disability situation creates a barrier from a professional point of view [6]. If the present obstacle situation is a real problem for the present or future work, it indicates the need for vocational rehabilitation [6].

2.3. The scope of vocational rehabilitation

Like all other rehabilitation services, vocational rehabilitation will continue to be a developing field based on the evidence gained through research. Described by H. Kayıhan in 2009 [17], vocational rehabilitation includes steps of assessment, guidance, training, placement, protection and monitoring. In the assessment, an analysis of the physical, mental and vocational abilities of a person who is injured or remains after the disease is made. During this analysis, it is very important for the evaluator to evaluate the findings effectively and efficiently and to know that the findings can vary according to personality traits during this process [11]. Proposals are made in the field of guidance for vocational education and employment opportunities. In the training section, the person is trained and prepared for the job. The next step is to help the person find a suitable job. Special arrangements make it easier for the recruited person to work. In the last step, the person is followed until the full adaptation to the job is secured [17].

In vocational rehabilitation, the cause of disability, the nature of disability and the age of the disabled person do not matter. The important thing is whether there is an obstacle to work. If the physical and/or mental disability of the person is an obstacle to the current or future work, then professional rehabilitation is needed [18, 19]. People with disabilities should be assessed on the basis of their capacities, competencies, potential and relevance before starting vocational training. Akel et al. [19] reported that even adolescents with chronic diseases should be educated about possible future occupations. Functional and work capacity of the people is investigated. Parallel to the results obtained, training is provided to increase the work potential of the person and to prepare him to the activities. Vocational rehabilitation team includes people from professional groups such as doctors, physiotherapists, occupational therapists/ergotherapists, psychiatrists, psychologists, course teachers, social workers, professional advisers and some other professionals as architects or engineers [17].

The 'International Classification of Functioning, Disability and Health' (ICF), created by the World Health Organization in 2002, classifies health and health-related areas by defining body functions and structure, activities and participation [11, 20]. These areas are categorized by physical, personal and social aspects. Since the function and disability of the subject are in the same context, ICF also includes environmental factors [11]. The social model and ICF are the models that professional rehabilitation practitioners can use. Even if the content of the

http://dx.doi.org/10.5772/intechopen.76721

models is not fully used, general order and principles can be used, while vocational rehabilitation programs are being created [11, 21]. In a study published in 2011 by Escorpizo et al., relevant results were found between assessment methods used in vocational rehabilitation and some ICF categories and pointed out the importance of using this model in vocational rehabilitation [21]. In another study in the United States, it was argued that the ICF model is a new turning point in understanding and addressing health and health problems [22]. It has been determined that this method may assist in occupational rehabilitation team, determine the necessary treatments, develop effective placement strategies and evaluate outcomes [22]. The ICF's core set for vocational rehabilitation has been formed to serve as an international standard and to measure and/or report concerning functioning of individuals at vocational rehabilitation programs [23].

2.4. Importance of functional capacity evaluations in vocational rehabilitation

Functional capacity evaluations are an objective measurement method that evaluates the activity status, activity limitations, physical requirements of the work and the general work situation of people with disabilities and those who have experienced work injury and gives suggestions for ultimately taking part in the job-related and participatory role [24–27]. These assessment methods have been used in North America since the early 1980s [13]. This term coincides with the time when ergotherapy is developing rapidly. The desire to find valid data in order to increase the return of persons to safe work has increased the importance of functional capacity evaluations. For the last 40 years, with the development of technology, more objective and computerized measures began to be used, resulting in healthier work choices and successful job placements [27–29]. Functional capacity evaluations are implemented by physiotherapists, occupational therapists, physicians, occupational rehabilitation consultants and many other professional occupations [9]. It is stated that the person who made the measurement should be trained in this subject [9, 11].

For people with physical disabilities to be employed, functional capacity needs to be evaluated first and then placed in appropriate jobs [8, 9, 30, 31]. Functional capacity evaluations can be made from medical, functional, psychological, physical and occupational aspects. Following the determination of the functional capacity, it is stated that the work analysis should be carried out at a later stage to assess the requirements of the work and the functional capacity should be adjusted to meet the needs of the job [4]. The decision should be made to place the person with disabilities in the work course or job [4]. As a result of the functional capacity evaluations, it is aimed to determine the capacity of the person to meet the demands of the job and the appropriate jobs [8–10]. If there is a problem to continue to work, an action plan should be made [10]. This plan should be to place the person in a modified job, to train the person about job demands, to direct the person to a treatment center when there is a medical problem, or to prepare the person for a new job with vocational rehabilitation if it is not possible to return to the previous job [10].

The purpose is very important when choosing a functional capacity evaluation method [24, 31]. If it is the intention to return to the old job, job requirements should be determined by job analysis [24]. Functional capacity evaluation results should be compared with the physical

requirements of the job [24]. A more general and comprehensive assessment should be done if the person is to be placed in a new job [24]. The physical condition is investigated from many directions and the most appropriate ones are identified from the various types of job opportunities available [24]. If the objective assessment of the functional capacity is to determine the disability status, then an evaluation method should be chosen where the evaluator can collect the desired information [24].

Functional capacity evaluations, such as all other tests performed in the field of rehabilitation, are generally planned according to the test and measurement standards established by the American Physical Therapy Association [32]. Functional capacity assessments are crucial to ensure reliable and valid results and to be safe and practical in practice [24, 30]. Reliability is stated as the most important factor that evaluations are standardized [24, 30]. Reliability studies of functional capacities for many different purposes have been accelerated after 1990, and clinicians have drawn attention to the importance of reliable assessment methods [33]. Reliability studies of newly produced evaluation methods continue at a rapid pace [33].

Lechner et al. [34] and Brouwer et al. [35] found that functional capacity evaluation protocols were reliable for people with low back pain and other musculoskeletal disorders. Lechner et al. evaluated 50 persons aged between 18 and 65 who had musculoskeletal discomfort and who spent at least 20 hours per week with the so-called Physical Work Performance Evaluation [34]. The reliability of interpersonal reliability when using the evaluation method of 11 physical therapists was found to be very high [34]. Gross and Battie [36] found that test–retest reliability of the results of functional capacity evaluation during lifting was high in people with low back pain. An evaluation system called 'Isernhagen Work System' was used in this study [36]. The authors state that when evaluating the operational definition, the safe and maximum performance detection is reliable when well explained to the evaluators [36].

Many types of validity were tested in the field of functional capacity assessments [30, 33]. Less validity studies were conducted compared to reliability studies [37]. The first study to question the validity of functional capacity assessment studies was conducted by Smith et al. [38]. In this study, 125 prisoners in prison were evaluated by 'Smith Functional Capacity Assessment Method', medical history was taken, and 'Patient Activity Questionnaire' was applied. According to these test results, the chances of returning to work were determined. One year after being released from prison, a questionnaire was sent to these persons, and their employment status was questioned. From the responses, it was determined that the results of the tests in the prison estimated the work situation to be 86%. Matheson et al. [39], who tested the predictive validity of functional capacity assessments, attempted to determine the return to work after 6 months without evaluating the individuals with chronic musculoskeletal system. In this study, a low lift was tested, and a 2% chance of returning to work for each added pound weight was found to increase by 2%. Lechner et al. [40] also tested the predictive validity of the 'Physical Business Performance Assessment', a functional capacity evaluation method, on 30 people with musculoskeletal dysfunction. As a result of this study, the results of functional capacity assessment were well validated in determining the chances of returning to work after vocational rehabilitation [40].

Compared to other assessments, functional capacity evaluations take longer [24, 30]. This can vary from a few hours to a few days, depending on the measurement protocol used [24, 30].

It is also stated that these evaluations are more suitable to be applied in the clinical environment instead of the business environment because they include equipment such as lifting units, weights and power measuring unit [30]. Because of these equipment, it is stated that the establishment of functional capacity evaluation units is almost as costly as the imaging methods at diagnostic centers [30].

The main components of functional capacity assessments can be summarized as data collection, physical assessment, physiological assessment and functional performance measures [24]. In the data collection section, file scans, interviews with people, or surveys are conducted [24]. Physical evaluations are performed to determine clinical findings related to the disease [24]. As a result of these findings, it is determined if there is inconvenience for physiological and functional evaluations to be done properly or if the person should be followed during evaluations [24, 30]. Physiological evaluations include sections such as assessment of muscle strength or cardiovascular endurance [24].

The business factors specified in the 'Job Titles Dictionary' (DOT) indicate both the physical requirements of the job and the capacity of the employee to fulfill those requirements [24]. These 20 physical requirements are used by rehabilitation specialists and business consultants to classify jobs [24, 26]. Functional performance assessments measure the physical requirements of this work [24, 26]. The lift capacity test is the most commonly used functional work measurement in the DOT [24]. However, it is stated that the measurement of lift capacity in different situations and in different positions is very important in terms of reliability of the test [24].

3. Ergonomic regulations at workplace

The study of ergonomics and work posture in workplaces has gained importance in recent years. Ergonomics is an interdisciplinary scientific discipline that scientifically examines and relates the relationship between people, the equipment and working environment they use to the field of application [41]. In order to harmonize the person, machine and work with each other in the best way, it examines the physiological, biological, anatomical and other specialties of the human being and enables the machine and work to be designed according to these characteristics [41]. This science helps to understand how human abilities and limitations are understood and how it can bring about performance in a safe, effective, comfortable and healthy way in relation to the environment [42, 43]. If a building is anthropologically, physiologically, sociologically and psychologically compatible, it must be able to perform daily activities [42, 44]. Effective and successful 'harmonization' guarantees high productivity, avoidance of disease and injury risk and increased satisfaction in the work [44]. In order to achieve these, technical and health teams must be in a successful cooperation [44].

Ergonomists should consider the special requests of the persons who will use the building during the construction, arrangement, or repair of a building, so that the space is useful, safe and effective [42]. Factors such as lighting, heat, noise, ventilation, cleanliness, humidity, as well as working hours and break times are examined in the field of ergonomics [11]. While arranging the environment of a disabled or elderly person, ergonomists find solutions by

evaluating every field and activity [42]. Ergonomic problems that occur during the working life of people with physical disabilities should be solved with the participation of many disciplines. Ergonomics is a multidisciplinary approach which addresses many disciplines as engineers, physicians, psychologists, physiotherapists, ergotherapists, architects, home economists and other disciples who have knowledge about anatomy, biomechanics, psychology, physiology, engineering principles, anthropometry, and kinesiology and the ones who solve stress factors at home, school, and workplace [17, 45].

The main physical problems that may arise as a result of interaction between human, environment, and equipment are musculoskeletal diseases [41]. Work-related musculoskeletal disorders refer to musculoskeletal disorders that affect work environment and work performance significantly. Workplace risk factors are thought to develop work-related musculoskeletal disorders with personal characteristics and social factors [46]. Jobs with multiple risk factors or increased working at high-risk conditions will increase the likelihood of having a musculoskeletal system disorder [44]. Repeated hand tasks with heavy work, heavy lifting, pushing heavy objects, pulling or carrying, long sitting in poor posture, monotonous work, inadequate intermittent rests, vibration, or cooling are the main risk factors [41]. The level of risk generated is determined by the severity of exposure to the risks, frequency, duration, and strength capacity of the person to meet other job requirements [44].

Inadequate working postures in jobs that require intense labour force cause inefficiency as well as musculoskeletal discomfort [41, 44, 47]. One of the aims of the ergonomics is to improve worker postures and balance worker capabilities and work requirements, resulting in improved worker safety, health, and overall productivity of the system [41, 44, 47]. Workplace injuries cause a decrease in one's work capacity and production [41, 44, 47]. While these injuries cause discomfort, reduced work capacity, and production affect economics negatively [44]. Therefore, the role of preventive rehabilitation becomes increasingly important in preventing these injuries and having a healthy musculoskeletal system [44]. One of the mechanisms of injury that is resulted from many risk factors is muscle loading [43, 48]. In poor working posture, degenerative changes occur in the affected joints and in the connective tissue [43, 48]. Repetitive movements and inadequate rest periods cause discomfort caused by muscular loads together with degenerative changes resulting from poor and bad posture [43, 48]. Another mechanism of injury that occurs during exercise is muscle fatigue. Static and dynamic loading resulting in muscular work with maximum capacity leads to muscle fatigue [43, 48].

Points to consider when designing a workplace to avoid work injuries are listed below [49]:

1. When the person is working, he should provide a straight and face-to-face posture.
2. If the vision is required during a job, the required work points should be visible when the head and neck are upright or only when the head is tilted slightly forward.
3. All business activities should allow one to work with many different but equally healthy, safe postures without diminishing the capacity.
4. Work should be arranged in such a way that the person must be standing or sitting in position according to his wishes. While sitting, both feet should have equal load, and the foot supports must be adjusted accordingly.

5. When standing, both feet should be loaded equally, and the foot supports should be adjusted accordingly.
6. Work activities should be arranged such that the joint movements are in the middle of the range of motion. This is especially true for the head, neck, and upper limbs.
7. When muscle force is required for the work, the force applied should be along the relevant limb and should be performed by the contraction of the most suitable large muscles.
8. Work should not be performed at the heart level or above the heart level, especially when using force above the heart level. Even at the light work, the upper extremities need to be rested when work has to be done above the heart level.
9. If there is a continuous force application, arms or legs should be used without having to organize on the equipment.
10. Rest periods should be provided at all workloads including environmental load, information load, and length of work.

3.1. Ergonomics for persons with disabilities

Ergonomic arrangement of a workplace is done by making the work suitable for the person to be worked on. Although the employee is selected according to his/her ability according to the work to be done, it is very important that the place to work matches the physical and psychological characteristics of the employee [44, 45]. 'Appropriate Settlement' was first used in 1990 to prevent discrimination against the people with disabilities and to remove the barriers to employment [14]. This term includes [1] provision of assistive equipment necessary for the job to be done, [2] modification to make the business environment fully accessible, [3] arrangement of the workflow, and [4] provision of personal assistance when needed. Unreachable workstations constitute a physical barrier, and if the workspace is not modified, it will prevent the desired work [7, 14]. Some workplaces are affecting the physical condition negatively due to the work they have installed on the person, which can reduce the person's independence both at home and in daily life [1, 14]. The person may not be able to keep the job any longer and then may be forced to another job or not to work at all.

Providing the necessary tools to do the job is a step in removing the barriers at the workplace [14]. Easy access to computer technology, software that understands speech, ergonomic keyboards, and mouth-controlled mice are frequently used in many disability groups [14]. In fields where computer technology is not used, envelope folding machines, electrical staplers, telephone headsets, and similar equipment can be useful for productivity [14]. Another step in lifting the barriers is to organize the physical work environment both personally and in general [14]. Business areas should be well illuminated, crossing areas should be expanded, maneuvering areas should be separated, and entrances without stairs should be provided [14, 44]. The regulation of the workflow is also important in ensuring accessibility [14, 44]. It should be ensured that the energy of the person is activated by arranging activities that are not necessary for the business [14, 44]. For example, placing frequently used equipment in close proximity, or lowering shelves where heavy items are placed, prevents the occurrence of fatigue and walking

difficulty [14]. In addition, to find the appropriate time to take a break without interruption and to change among employees in monotonous work are the steps that can be taken in order to streamline the workflow [14]. Some employees may need physical help despite all the arrangements [14]. Office design should be done in such a way that employees can help each other when needed or a place where an assistant can work if required [14].

Different studies done by Belgen et al. [50] and Çalık et al. [51] reported that the majority of people with disabilities work with high-risk posture and this creates risk of musculoskeletal problems [50, 51]. An employer who will hire a person with physical disabilities should follow a conscious attitude to what positions he or she will be employed and the places in which the person concerned will be interested. It is aimed to create the work to be done with the ergonomic arrangement to ensure the employee's harmony with the work environment [42, 44, 45, 50, 51]. This is only possible when anthropometric point of view, physiological point of view, psychological point of view, information point of view, and safety point of view are all considered [42, 44, 45]. Only when all these conditions are met, the person can perform all the necessary activities appropriately [42]. Conditions that are often neglected for people with disabilities are anthropometric, physiological, and psychological conditions [45].

3.2. Accessibility at work for people with disabilities

Accessibility means that a person with a disability can move around as he or she wants without any intermediary. Accessibility is the most important point that should be given importance in workplaces where people with disabilities are. Accessibility of the workplace is the independent completion of all phases between the door of the house and the start of work at the workplace. The barrier most frequently shown as an obstacle to work is a workstation that is inaccessible [7, 14].

The accessibility feature should also be considered parallel to the vertical area, also called the comfort zone. This area is the vertical field from the lowest level that a person can reach to the highest level that one can reach while standing. The limits set for the Turks in this regard are the upper reach limit of 115.6 mm (the small woman with the wheelchair) and the lowest reach limit of 665 mm (the long male using the seat handle) [44]. This area marks the location of many control buttons, such as power switches, door handles, sockets, and so on, which must be present at the workplace. Changes in this area in the business environment also prevent the disabled employee from being dependent to others [43, 45].

Optimum placement will not make anyone happy because the various places in the workplace can be used by people with many different characteristics. As a result, both horizontal and level of adjustability are always the best solutions. The height of the seat to be seated, the height of the counter, the height of the sinks, and the height of the cabinets to which the items of interest are to be placed must always be adjustable [14, 44, 52]. Özyörük and Kütük [52] reported that redesigning of working environment to increase work efficiency made positive changes and achievements were gained.

3.3. Ergonomic risk factors

Work-related factors that cause musculoskeletal disorders and accelerate discomfort are called ergonomic risk factors. These factors directly or indirectly affect the occurrence of discomfort. Ergonomic risk factors are examined under three main headings [41]. These are:

http://dx.doi.org/10.5772/intechopen.76721

1. Physical factors
2. Environmental factors
3. Psychological factors

3.3.1. Physical factors

Repetition of the same movements during work, improper postures, static posture, excessive use of force, and squeeze are the physical dimensions of the ergonomic risks. Repetitions of the same or similar movements during work can cause pain and discomfort in the musculoskeletal system because the muscles are not given enough time to rest [41]. Natural postures are the safest and most convenient way to work. Non-natural postures force the physical limits of the body by putting pressure on the muscles and joints. The long standing of the worker in the same position limits the blood flow and makes the muscles tired and injured. The excessive force applied to the muscles causes the muscles to contract more than normal, causing the joints to overload and cause injuries. Compression of the soft tissue between a bone and a hard or sharp object reduces blood flow and nerve conduction, damaging tendon and tendon sheath [41].

3.3.2. Environmental factors

Noise, temperature, humidity and airflow, lighting, vibration, and chemicals are among the ergonomic risks. The organizer of the workplace should also pay attention to environmental factors. The obligation of the human body's limits, job requirements, and the characteristics of the equipment means to ignore the role of the environment.

The body of a working person may be exposed to certain environmental factors. Environmental interactions above the limits can cause different body parts, leading to cumulative trauma. The use of vibration absorbing equipment, the use of extreme cold or hot barriers or insulation clothing, the construction of barriers where there is airflow, and the introduction of a crusher on the computer screen for reflected light can reduce the environmental impacts of the body through simple, non-costly measures [41].

3.3.3. Psychological factors

Psychological risk factors include mental overload, psychosocial effects, social communication in the workplace, and organizational influences. It has been determined that these factors, which include all employees and employers, increase ergonomic risk and should therefore be considered [41, 44].

Many musculoskeletal system diseases that involve the abdomen, neck, upper extremity, and lower limbs in our country are accepted as occupational diseases in the law [41]. However, data on the frequency of these diseases, risk factors, workday loss, insurance indemnity, and cost are not available [41]. Work-related musculoskeletal diseases, which are among the most important problems of employees and which reduce work efficiency, and prevention of adverse effects of these diseases are possible with ergonomic education and initiatives [41, 53].

Employees, employers, and professionals and organizations dealing with occupational health should be informed about work-related musculoskeletal disorders and prevention, and community awareness should be established [41, 53–55]. Studies done with different groups of employees emphasize the importance of workplace assessment and health evaluations to be done actively, and continuous training should be provided for all workers [53–55].

3.4. Evaluation of ergonomic risk factors at workplace

It is important to assess risk in terms of health and safety, including the situation of employees who are likely to be affected by the risks present at the workplace [41]. Following these assessments, the protective measures to be taken and the protective equipment to be used can be determined [41]. Ergonomic analysis methods are used to evaluate the ergonomic risk factors in the study area. Ergonomic analysis is a mechanism used to facilitate the identification of existing problems in the field of work [12, 41, 56]. The work is carried out by systematically recording the effects of work on the person or the specific views of the work [56]. With these analyses, ergonomic defects and possible health hazards can be identified and subsequently eliminated. During the analysis, all factors considered for each individual situation, technical and personal factors, should be evaluated [56].

When choosing which of the many analysis methods available today is to be used, the objectives should be [43, 56]:

- Working environment, working place, working style, design of equipment.
- Prevention of work injuries, work-related disorders and diseases.
- Continuing and enhancing the ability of the disabled and elderly to work.
- Obtaining information for the prevention of occupational injury or illness.
- Evaluation of work and characteristics of the work related to health care and planning of research programs.

Assessment methods include checklists, workplace analysis observations of work postures and movements, and self-filled surveys [43, 56]. Checklists are an evaluation method that consists of many questions and examines various factors. The most commonly used checklist is the 'General Ergonomic Risk Analysis Checklist' prepared by the International Ergonomics Association [56, 57]. Workplace analysis determines workplace characteristics such as workplace, general physical activity, lifting, work postures and movements, accident risk, occupational satisfaction, difficulty in decision-making, work repetition, attention, air temperature, and noise. Work postures and movement analysis are needed to be done at work to make a more precise analysis of the problems caused by work postures and movements. Today, there are many observation methods. The most commonly used pole is the pencil-paper method based on visual observation. In recent years, photography, videotape, and computer systems have also been used frequently.

The Ovako Working Posture Analysis System (OWAS) and Rapid Upper Limb Assessment (RULA) are commonly used methods for evaluation of easy and practical posture movements requiring direct observation. OWAS examines the upper extremity/shoulders, lower extremity, head, and load-lifting postures [56, 57], while RULA examines upper extremity working posture.

Conflict of interest

No conflict of interest.

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