

# The role of optometrists in visual ergonomics. Workplace evaluation and design changes implementation.

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## Abstract:

This study focuses on the evaluation and management of improper design from an ergonomic perspective.

Visual ergonomics emphasizes optimizing visual conditions and body posture to minimize eye fatigue, head/shoulder/wrist aches, eye strain, chemical burns, and other symptoms associated with incorrect ergonomic design.

Optometrists play a crucial role in identifying and addressing these issues by providing personalized solutions and ergonomic advice.

## Purpose

The purpose of this study was to underscore the importance of a thorough workplace evaluation from an ergonomic standpoint conducted by an optometrist.

## Methods

An optometric investigation was performed at the optical center . Thirty-five patients underwent the examination, and a questionnaire was used to assess the ergonomic design of their workplaces. Patients were categorized into two groups: individuals with good ergonomic features (proper monitor placement, adequate lighting, and regular breaks) and individuals with poor ergonomic conditions.

## Results

The investigation revealed that individuals with improper ergonomic design experienced a higher prevalence of visual impairments, such as eye strain, blurred vision, and dry eyes. Additionally, they reported musculoskeletal discomfort such as headaches, shoulder and neck pain, and wrist discomfort. These findings underscore the significance of ensuring adequate workenvironment ergonomics.

## Conclusion

Collaboration between optometrists and employees and ongoing assessments can ensure the implementation of effective ergonomic changes, leading to improved visual health and reduced work absenteeism.

## Keywords

Ergonomics,optometrists,evaluate,workplace,advice

## Introduction

Today, some workers often use multiple digital devices (including desktops, laptops, tablet, and handheld computers) .Workers may not have a designated workstation; instead, they can select and change their work locations throughout the day.[4]

In addition,the surveys found out that prolonged use of computers in awkward postures can result in musculoskeletal disorders.[5]

Some surveys have found a significant increase in ocular health problems associated with work,such as dry eyes, headaches and blurry vision. Prolonged use of computers in awkward postures can result in musculoskeletal disorders.This problems might be the result of inadequate workplace design,that does not fit the employees personal dimensions.

The optometrists may be the specialists who can take care of this problem ,by discussing in particular with every patient and giving them advice about the standards of an ergonomic place.Thereby improving patients well-being at the workplace.

Visual ergonomics is the science that applies theories and methods to the design and assessment of systems in order to optimize overall performance. [1,3]

Optometrists as eye health advisors should take care of the following tasks:

- 1.Providing guidance on the proper positioning of the monitor to avoid potential reflections, optical aberrations, and improve body posture.

2. Participating in television shows to promote proper workplace lighting, such as demonstrating the correct positioning of employees in relation to the window light, and discussing the appropriate sources of lighting used indoors and outdoors.
3. Providing instructions on the proper use of eye protection objects in various professions such as welders, dentists, laboratory technicians, construction workers, and office workers.
4. Highlighting the first aid measures in eye injuries at the workplace. To emphasize the importance of knowing how to respond to unforeseen incidents to minimize damage.
5. Identifying risk factors in employees work environment and reducing them through ergonomic design techniques (ex. placing warning signs on doors of areas where radiation is present to mitigate potential hazards)

## Material and Methods

A study was conducted in an Optic Center in Chisinau, starting from May 2022 to January 2024, following the guidelines set forth in the Declaration of Helsinki about ethical principles for medical research involving human subjects.

Informed consent was obtained from all participants before they completed the questionnaire.

In this survey, a sample of 35 patients (70 eyes) were selected. The age of the interviewed patients ranged from 20-48 years.

**Inclusion Criteria:** Inclusion criteria for this study were office workers who were at least 20 years old and had been working in their current job for at least six months.

**Exclusion Criteria:** office workers who had a history of eye problems, were currently taking medication that could affect their alertness, or uncooperative patients and subjects that do not work in an office environment. The investigation participants were subjects that work in an office, and use a computer more than 4 hours per day.

A questionnaire was used to note any potential ocular hazards at office workplace and to discover the most frequently encountered symptoms in these workers and the ergonomic mistakes that cause them.

## Illumination evaluation

Illuminance level is associated with subjective alertness[2]

In questionnaire were included questions about types of lighting sources included in the design of the office, their positioning in relation to the workers, the presence of natural light coming from the window and the positioning of the employees in relation to the light from the window.

## Work practices analysis:

Type of work habits

The frequency of display screen cleaning

The number of breaks during work

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## Workstation assessment

Subjective information was collected about basic dimensions and settings such as:

Viewing distance from eye to display screen

The possibility of raising or lowering the monitor

The glare filter presence on the screen

Viewing distance from eye to keyboard

## Objective evaluation

The individuals were asked to mimic the posture they adopt while working ,and to position the laptop's screen in the same way they place it in the office. This way

the optometrists can analyze the working position adopted and provide instructions for possible changes.

## Symptoms assessment

We collected data about both visual and musculoskeletal discomfort

## Results

The outcome of this study is represented by the following numbers

### 1.Frequency of screen cleaning

The majority of participants (80%) reported cleaning their screens less frequently than once every two weeks.

15 % of them cleaned their screens every two weeks.

Only 5 % of participants reported cleaning their screens at least once a week.

Number of breaks taken from work:

On average, participants took 2-3 short breaks during their work hours

The duration of these breaks ranged from 5 to 15 minutes

60 % of participants reported taking breaks to rest their eyes or stretch their legs.

Distance between eyes and monitor

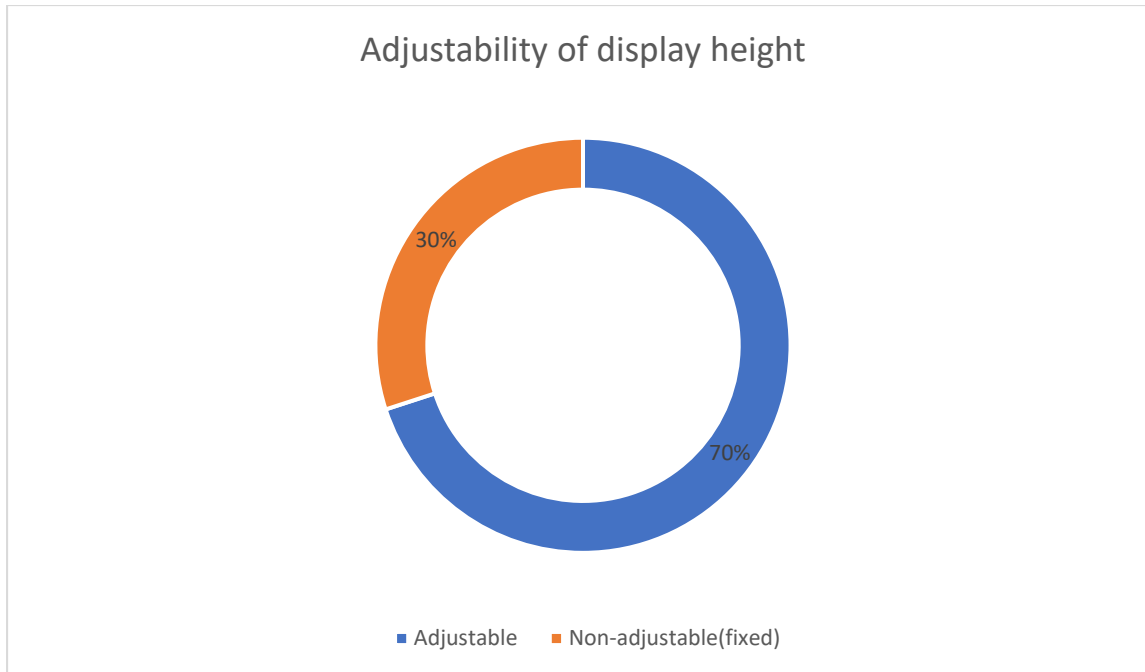
The average distance was found to be approximately 50-70 centimeters.

80% of subjects maintained a distance within the recommended range.

Adjustability of the monitor's height:

70 % of individuals had adjustable monitors that allowed them to raise or lower the screen according to their preference.

The remaining 30 % had fixed-height monitors.



#### Presence of an anti-glare filter

80 % of participants had an anti-glare filter installed on their monitors. This is because manufacturers understand the importance of providing a comfortable and visually-friendly experience for computer users.

Distance between eyes and keyboard in average was approximately 40-60 centimeters, and 90 % maintained a distance within the recommended range

#### Light sources

60 % of participants reported using fluorescent lighting in their offices, while 40 % used incandescent lighting.

#### Positioning of light sources

Among those using fluorescent lighting, 75 % mentioned that the lights were positioned above the workstations, providing direct illumination.

For participants using incandescent lighting, 55 % reported having the lights placed on the sides of their workstations, providing indirect illumination.

### Natural light

80% of respondents reported having access to natural light in their office spaces through windows.

### Window positioning

65% of participants mentioned that the windows were positioned in front or to the side of workplace, allowing for natural light to reach them during the day

35% reported having windows located behind their workstations, resulting in limited exposure to natural light

### Desk Lamps

45 % of participants reported having desk lamps in their offices, which they used in addition to the overhead lighting.

## Discussion

The results of this survey show us the habits employees adopt while working.

Firstly, we can observe that most people don't clean their screens as often as they should. This bad habit can lead to a buildup of dust and dirt that can strain the eyes.

A significant impact can be made by optometrists, as they can participate in shows and raising awareness about potential risks that people may not even consider important.

Taking breaks from work is also an important activity for worker's well-being. It's encouraging to observe that participants reported taking at least 2-3 short breaks during their work hours. During these little breaks they can give their eyes a rest and allow the body to stretch itself for reducing musculoskeletal symptoms.

Keeping the right distance between eyes and computer screen is crucial for visual comfort. The investigation found that most participants maintained a distance within the recommended range.

Having an adjustable monitor is another key factor in a comfortable workstation.

Concluded by the study was the fact that majority of individuals reported the possibility of raising and lowering the monitor. However, the rest 30 % are at a higher risk of getting chronic neck and shoulder pain caused by the uncomfortable position adopted by the body in order to compensate the visual demands.

When it comes to lighting, the survey found that most of the subjects used fluorescent lighting in their offices. It's important for optometrists as eye care advisors to give instructions and make sure the lighting is not too harsh or bright, as this can also cause difficulties in visual demanding tasks.

While the majority of participants using fluorescent lighting had the lights positioned above their workstations, providing direct illumination, a significant proportion of subjects using incandescent lighting had the lights placed on the sides, providing indirect illumination. This is worth taking into consideration by designers because it can lead to uneven lighting and potential glare issues.

Access to natural light provided by windows is concluded to be accomplished by the most of people. This natural light has been shown to improve mood, productivity, and overall health. However when it comes to positioning, there were some participants who reported having windows behind their workstations, resulting in limited exposure to natural light. This could be an area for improvement in office design to enhance the working environment.

Lastly, worth mentioning is that desk lamps were present in an amount of 45 %, providing additional task lighting and allowing users to adjust the lighting according to their needs.

All the negative conclusions highlight areas for improvement in terms of screen cleaning habits, adjustability of monitors, access to natural light, and proper positioning of lighting sources.

## Conclusion

In conclusion, optometrists play a crucial role in visual ergonomics by providing expertise in evaluating and optimizing visual conditions in the workplace. Through their knowledge of vision and eye health, optometrists can assess the visual



demands of various work environments and recommend ergonomic adjustments to enhance visual comfort and productivity.

By conducting workplace evaluations and collaborating with employers to implement design changes, optometrists can help create safer and more visually supportive workspaces. These changes may include optimizing lighting conditions, reducing glare, adjusting monitor positions, and promoting proper viewing distances to reduce eye strain and discomfort.

Ultimately, the involvement of optometrists in visual ergonomics can lead to improved visual health, increased employee satisfaction, and enhanced overall workplace efficiency. By prioritizing visual ergonomics and seeking guidance from optometrists, organizations can create a work environment that promotes healthy vision and optimal performance for employees.

The future scope of optometrists in visual ergonomics is vast, with opportunities for further research and collaboration with other healthcare professionals to improve workplace visual ergonomics and enhance overall well-being.

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