Section: Optometry

Original Research Article

# THE POST PANDEMIC: DIGITAL EYE STRAIN IN HYBRID WORKERS

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## ABSTRACT

**Background:** The increased use of digital devices and hybrid work environments after the COVID-19 pandemic has significantly contributed to the rise of digital eye strain among workers. Prolonged screen exposure and frequent switching between workspaces may negatively affect accommodative function and visual comfort. The purpose of this study was to evaluate the prevalence of digital eye strain among hybrid workers and to assess the impact of workspace switching on accommodation recovery. **Materials and Methods:** A cross-sectional observational study was conducted among 200 participants involved in hybrid work and prolonged digital screen usage. Data were collected using a structured questionnaire regarding screen time, workspace switching, and symptoms of digital eye strain. Near–far accommodation testing was also performed on 50 participants to evaluate relaxation and stimulation responses. SPSS version 32.0 was used for statistical analysis. Frequencies, percentages, descriptive statistics, Chi-square tests, and paired sample t-tests were applied. **Results:** The findings demonstrated a high prevalence of digital eye strain symptoms among participants. Common symptoms included eye strain, headaches, dryness, blurred vision, and focusing difficulties. Most participants reported prolonged daily screen exposure. Workspace switching was commonly observed among hybrid workers. Accommodation testing showed a statistically significant difference between relaxation and stimulation responses ($p < 0.001$), indicating accommodative stress among prolonged digital device users. However, the association between screen time and eye strain was not statistically significant ($p > 0.05$). **Conclusion:** Hybrid work environments and prolonged digital device usage contribute significantly to digital eye strain and accommodative dysfunction in the post-pandemic era. Proper ergonomic practices, visual hygiene, and awareness programs are necessary to reduce visual fatigue among hybrid workers.

## INTRODUCTION

Digital technology has become an essential component of modern life, especially after the COVID-19 pandemic. Remote working, online communication, and digital collaboration significantly increased screen exposure among workers worldwide. As a result, digital eye strain (DES), also known as Computer Vision Syndrome, has emerged as a growing public health concern. Digital eye strain also referred to as Computer Vision Syndrome, have become more common in modern-day society. The syndrome has received significant interest especially during and post the coronavirus disease pandemic since people became heavily reliant on the use of digital gadgets in their day-to-day lives, work, and virtual education due to social distancing protocols (World Health Organization, 2020; Sheppard & Wolffsohn, 2018). Over-screen time is associated with various ocular problems such as eye strain, tiredness, dryness, blurred vision, headaches, and problems with concentration. The problems arise due to a variety of reasons including decreased blink rate, focusing on close objects for extended periods, glare from computer screens, and low light conditions (Kaur, Gurnani, & Nayak, 2022). According to the American Optometric Association (n.d.), people who use digital devices for more than two hours without interruption are at a greater risk of developing digital eye strain.


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Another critical issue responsible for this concern includes the rising use of technology amid the coronavirus pandemic. According to the World Health Organization (2020), the novel coronavirus pandemic affected the patterns of use of digital devices, thus increasing the amount of time spent looking at screens. Moreover, recent research indicated an increase in cases of digital eye strain among teleworkers during the specified time period (Wang et al., 2021).

Hybrid working has been widely adopted as a flexible work model in recent times. This involves splitting one's working hours between home and office locations. Although hybrid working provides flexibility, it comes with many issues concerning visual well-being. Firstly, hybrid workers experience varied environments when working from home or at the workplace. Lighting, ergonomic factors, screen placement, and desk arrangement may vary between the two locations. The differences may lead to more eye discomfort among hybrid workers (Anshel, 2007).

In the post-pandemic world, the use of digital devices has profoundly altered the way people work and how their workplace looks. Hybrid workplaces demand a high level of time on the computer, smartphone, tablet and laptop, and the frequent shift between home and office. Digital eye strain and accommodative stress can be possible risk factors if using digital screens under different environmental and ergonomic conditions continuously. While several previous studies have examined digital eye strain among digital device users overall, few studies have examined digital eye strain among hybrid workers and how switching workspaces affects recovery of vision. The majority of existing studies focus on the duration of screen exposure, and the effect of work environment changes on visual adaptation and accommodative function has been less studied.

Hybrid workers may experience poorer visual comfort and recovery from that discomfort due to frequent changes in lighting, screen set-up, distance from the screen, and workplace ergonomics. Hence, this study aimed to assess the prevalence of DE and to see if switching workspace would lead to accommodative dysfunction and visual fatigue in the post-pandemic period amongst the hybrid workers. The conclusions of this research can contribute to raising awareness about occupational health and vision and prevent digital eye strain, the ergonomic design of the workplace and the need for proper visual hygiene of users of digital devices.

## MATERIALS AND METHODS

A cross-sectional observational study was conducted among 200 hybrid workers using digital devices for prolonged periods. Participants were selected through convenient sampling. Individuals involved in hybrid work environments and prolonged screen-based activities were

Data collection was carried out using a structured questionnaire containing information regarding demographic data, screen time exposure, workspace switching, and symptoms related to digital eye strain. Near–far accommodation testing was performed on 50 participants to assess relaxation and stimulation accommodation responses.

The inclusion criteria included hybrid workers using digital devices regularly, while individuals with pre-existing ocular diseases or previous eye surgeries were excluded. Ethical approval and informed consent were obtained before data collection.

SPSS latest version 32.0 was used for statistical analysis. Frequencies, percentages, descriptive statistics, Chi-square tests, and paired sample t-tests were applied. A p-value less than 0.05 was considered statistically significant.

## RESULTS

[Figure 1] The study included 200 participants involved in hybrid work environments. Most participants reported prolonged digital screen exposure exceeding several hours daily.

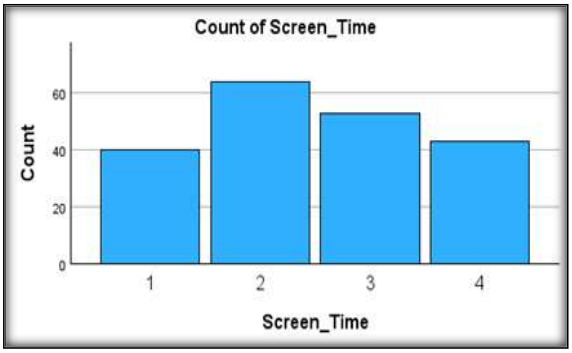


**Figure 1**

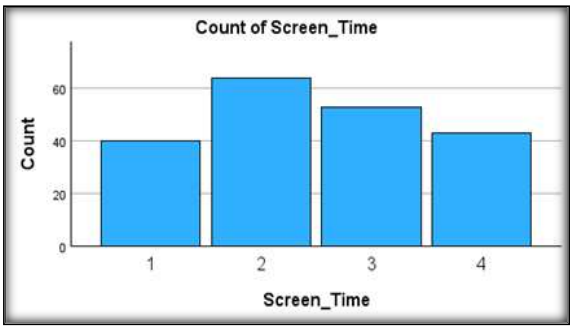


**Figure 2**


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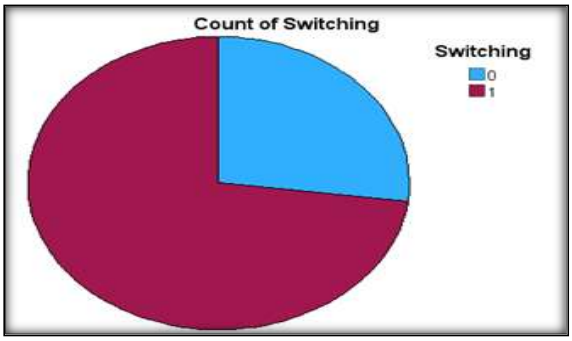


**Figure 3**

[Figure 1] illustrates the daily screen exposure of participants. Most participants reported using digital devices for more than 3 hours daily.

[Figure 2] A high prevalence of digital eye strain symptoms was observed among participants. Commonly reported symptoms included eye strain, headaches, dryness, blurred vision, and difficulty focusing.

[Figure 3] Shows the occurrence of digital eye strain among the respondents of the study. The graph shows that many of those who took part had symptoms of digital eye strain. Of the 200 participants, 167 participants (83.5%) experienced symptoms of eye strain and 33 participants (16.5%) did not experience symptoms.

[Figure 3] The frequency distribution showed that workspace switching was highly prevalent among hybrid workers. Many participants reported alternating between office and home working environments regularly.

The workspace switching distribution of participants in the study is shown in Figure 3 As illustrated in the graph.

[Table 1] Chi-square analysis demonstrated no statistically significant association between screen time and digital eye strain ($p > 0.05$). However, accommodation testing showed a statistically significant difference between relaxation and stimulation responses among participants ($p < 0.001$).

**Table 1: Shows the Results of Chi-Square Analysis Used to Determine the Statistical Relationship between Daily Screen Time and Digital Eye Strain in the Participants**

| **Chi-Square Tests** | | | |
|---|---|---|---|
| | **Value** | **df** | **Asymptotic Significance (2-sided)** |
| Pearson Chi-Square | 5.308a | 3 | .151 |
| Likelihood Ratio | 5.013 | 3 | .171 |
| Linear-by-Linear Association | 4.296 | 1 | .038 |
| N of Valid Cases | 200 | | |
| | | | |
| 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.60. | | | |

**Table 2: The Paired Sample T-Test Demonstrated Delayed Accommodation Recovery among Prolonged Digital Device Users, Suggesting Accommodative Stress Associated with Continuous Near Work and Hybrid Working Conditions**

| **Paired Samples Test** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | **Paired Differences** | | | | | **t** | **df** | **Significance** | |
| | | **Mean** | **Std. Deviation** | **Std. Error Mean** | **95% Confidence Interval of the Difference** | | | | **One-Sided p** | **Two-Sided p** |
| | | | | | **Lower** | **Upper** | | | | |
| Pair 1 | Relaxation - Stimulation | .8320 | .3633 | .0514 | .7287 | .9353 | 16.192 | 49 | <.001 | <.001 |

## DISCUSSION

This study aimed to investigate the prevalence of digital eye strain in hybrid workers and to determine the impact of the switch of workspace on accommodation recovery in the post-pandemic period. The study results showed that digital eye strain symptoms were prevalent among the participants who were exposed to long hours of digital devices. The findings showed that the majority of the participants suffered from symptoms such as eye strain, headaches, dryness, blurred vision, and shortness of concentration. The results obtained here are in line with that of Rosenfield (2016) who stated that long exposure to digital screens is strongly correlated with visual fatigue and eye discomfort. Likewise, Sheppard and Wolffsohn (2018) found that overuse of digital devices is a major factor in digital eye strain symptoms and can be particularly problematic for those performing repetitive digital activities. The current study also found that longer TV viewing time was correlated with higher visual discomfort for the participants. The majority of people reported spending over 3 hours per day on digital devices, which can lead to a higher level of accommodative stress and less blinking. There may be a decrease in blinking while viewing a screen, which can result in tear film instability and an increase in dry eye symptoms.

These results corroborate the results of Portello, Rosenfield, and Chu (2012) who explained that reduction in blink rate when using a screen plays a significant role in ocular surface discomfort and dryness. The other important finding of this study was that workspace switching was found to be significantly related to digital eye strain. Participants


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who had a high frequency of working at home and at their office experienced a higher level of visual fatigue than those who worked in a more stable environment. Differences in lighting conditions, viewing distance, ergonomics and screen set-up can lead to accommodative stress and discomfort. This was confirmed by Anshel (2007) who stated that inappropriate visual ergonomics and lack of uniformity in the workplace have a negative impact on visual comfort and performance. In the present study, clinical accommodation testing confirmed that there was a significant difference between the relaxation vs. stimulation response. Prolonged digital device users showed delayed accommodation recovery as a result of increased relaxation time. Results indicate that regular near work and frequent exposure to digital screens can disrupt the accommodation process and recovery mechanisms.

## CONCLUSION

The study concluded that digital eye strain is highly prevalent among hybrid workers exposed to prolonged digital screen usage. Workspace switching and continuous near work contributes to accommodative stress and visual fatigue. Increased awareness regarding ergonomic practices, regular visual breaks, and digital eye health is necessary to minimize ocular discomfort among hybrid workers.

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