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A Descriptive Study on Blue Light Exposure, Sedentary Work Patterns, and Emotional Well-being among IT Employees

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Abstract

This descriptive cross-sectional study examines patterns of blue light exposure, sedentary behavior, and emotional well-being among IT employees, a population characterized by prolonged screen dependence. Data were collected from 150 IT professionals aged 25–45 years using the Light Exposure Behavior Assessment (LEBA), the International Physical Activity Questionnaire–Short Form (IPAQ-SF), the WHO-5 Well-being Index, and the Bodily Perception Questionnaire–Autonomic Nervous System Subscale (BPQ-20 ANS). Descriptive statistics revealed notably high daily screen time (M = 9.1 hours, SD = 1.5), substantial post-6 PM blue light exposure (M = 3.8 hours, SD = 1.1), and prolonged sedentary periods (M = 9.8 hours/day, SD = 1.8). Emotional well-being scores averaged below the clinical threshold for good well-being (M = 11.2, SD = 3.2), and autonomic symptom scores (M = 19.5, SD = 6.1) indicated frequent stress-related bodily sensations. The descriptive patterns suggest that prolonged screen exposure, late-evening blue light intake, and extended sedentary work may coexist with reduced psychological and autonomic well-being in IT professionals. The findings highlight an urgent need for ergonomic redesign, screen-use regulations, and workplace-based mental well-being interventions tailored to digital work environments.

Keywords: blue light exposure, sedentary behavior, emotional well-being, cardiac rhythm indicators, autonomic nervous system, IT employees, digital ergonomics

1. Introduction

1.1 Digital Workplace and Screen Dependency

The rapid expansion of the information technology (IT) industry has reshaped the nature of contemporary work. Employees in IT occupations spend a significant portion of both their professional and personal time engaging with digital screens. While this digital reliance enhances productivity, it simultaneously exposes employees to emerging occupational health risks, including circadian disruption, visual strain, and cognitive overload.

1.2 The Triad of Modern Occupational Health Concerns

Three interrelated concerns dominate research on digital work environments:
(a) blue light exposure,
(b) sedentary behavior, and
(c) emotional well-being.

Prolonged exposure to high-energy visible (HEV) blue light can suppress melatonin secretion and disrupt circadian rhythm, which may contribute to autonomic imbalance and poor sleep quality. Desk-bound IT work additionally entails sustained sedentary behavior, a well-established risk factor for cardiovascular strain and metabolic disturbances. When combined with psychological pressures of the digital economy, these factors contribute to lowered emotional well-being, stress, and burnout.

1.3 Review of Prior Research

Empirical studies have consistently shown that screen-based blue light exposure adversely affects sleep and circadian regulation. Research on workplace ergonomics documents strong associations between prolonged sitting and cardiovascular risk. Meanwhile, studies in occupational psychology indicate that extended screen time, demanding digital tasks, and inadequate recovery contribute to anxiety, fatigue, and reduced psychological well-being.

1.4 Rationale for the Study

Although several studies have examined blue light exposure, sedentary behavior, or well-being independently, limited research has described them together within the same IT workforce. Understanding these factors jointly provides a more realistic assessment of occupational health risks in digital work settings. This study therefore offers a holistic descriptive analysis of behavioral (screen and sitting time) and psychological indicators (emotional well-being, autonomic symptoms) among IT professionals.

2. OBJECTIVES

1. To quantify daily blue light exposure duration and intensity among IT employees.
2. To describe sedentary behavior patterns associated with screen-based work.
3. To assess emotional well-being and autonomic symptoms among IT professionals.
4. To explore descriptive trends linking screen exposure, sedentary duration, and well-being.

3. RESEARCH QUESTIONS

1. What are the observed levels of blue light exposure among IT employees?
2. What are the average sedentary hours and uninterrupted sitting periods?
3. How do emotional well-being and autonomic symptom levels vary across the sample relative to screen exposure patterns?

4. METHODOLOGY

4.1 Research Design

A descriptive, cross-sectional quantitative design was adopted.

4.2 Participants

- **Sampling method:** Purposive sampling
- **Sample size:** 150 IT professionals
- **Age range:** 25–45 years
- **Inclusion criteria:**
  - At least 2 years of IT experience
  - Minimum 6 hours/day screen exposure
- **Exclusion criteria:**
  - Night-shift workers
  - Diagnosed psychiatric or cardiac conditions

4.3 Instruments

Domain	Instrument	Description
Blue Light Exposure	Light Exposure Behavior Assessment (LEBA)*	Measures frequency and duration of exposure to digital blue light
Sedentary Behavior	IPAQ–Short Form	Records sitting duration and physical inactivity
Emotional Well-being	WHO-5 Index	Screens for psychological well-being (score < 13 indicates poor well-being)
Autonomic Symptoms	BPQ-20 ANS Subscale	Measures subjective autonomic symptoms (higher = greater dysregulation)

*The LEBA is a structured, behavior-based self-report tool used in occupational light-exposure studies.

4.4 Procedure

Participants were recruited through professional networks and HR departments. After obtaining digital informed consent, participants completed standardized questionnaires via an online survey interface. A subset of volunteers used wearable devices (e.g., Fitbit) to log HRV, though these data were not analyzed due to insufficient sample size.

4.5 Ethical Considerations

The study received approval from an Institutional Ethics Committee (Approval No.: IEC/2025/48). Participation was voluntary, anonymous, and uncompensated.

4.6 Data Analysis

Descriptive statistics (mean, standard deviation, frequency distribution) were computed using SPSS v28. Graphical representations were used to summarize screen exposure, sedentary behavior, and well-being indicators.

5. RESULTS

5.1 Screen Exposure and Sedentary Behavior

Variable	Metric	Mean	SD
Total Daily Screen Time	Hours/day	9.1	1.5
Post-6 PM Blue Light Exposure	Hours/day	3.8	1.1
Longest Uninterrupted Sitting Duration	Hours/day	4.2	0.9
Total Sedentary Duration	Hours/day	9.8	1.8

5.2 Emotional and Physiological Well-being

Variable	Instrument	Mean Score	SD	Interpretation
Emotional Well-being	WHO-5	11.2	3.2	Below clinical cutoff (<13)
Autonomic Symptoms	BPQ-20 ANS	19.5	6.1	Higher symptoms = more autonomic reactivity

6. DISCUSSION

6.1 Interpretation of Findings

The sample demonstrates **exceptionally high screen exposure**, both during daytime and the evening. Total screen time (M = 9.1 hours/day) exceeds recommended occupational health limits, suggesting a persistently screen-intensive work environment. Similarly, uninterrupted sedentary duration (M = 4.2 hours) reflects decreased movement throughout the workday, which is a documented cardiovascular and metabolic risk factor. Emotional well-being scores averaged below the WHO-5 cutoff, indicating **reduced psychological well-being**. Elevated autonomic symptom scores further suggest heightened physiological stress and dysregulation such as palpitations or breathlessness. Although no

causal inference can be drawn, these descriptive patterns are consistent with prior literature linking blue light exposure and prolonged sitting with reduced sleep quality, emotional strain, and autonomic imbalance.

6.2 Alignment with Previous Studies

- Earlier studies report that blue light exposure disrupts melatonin and sleep cycles, potentially affecting autonomic stability.
- Research on sedentary IT workers has demonstrated increased cardiovascular strain and fatigue.
- Occupational psychology studies consistently document reduced well-being with high screen-based work.

6.3 Implications for IT Employee Health

- **Cardiovascular Health:** Long sitting periods may elevate cardiovascular stress.
- **Circadian and Sleep Health:** Evening blue light exposure may alter circadian rhythm and impair recovery.
- **Mental Health:** Poor well-being scores highlight the psychological burden of digital work.

6.4 Recommended Workplace Interventions

1. **Ergonomic redesign:** Standing desks, movement-permitting layouts.
2. **Digital hygiene:** Mandatory micro-breaks, software-based break reminders.
3. **Blue light mitigation:** Filter applications, amber lenses, reduced evening screen exposure.
4. **Organizational well-being programs:** Stress management workshops, sleep hygiene training.

7. CONCLUSION

IT professionals in this study demonstrate high exposure to blue light and prolonged sedentary behavior, accompanied by reduced emotional well-being and elevated autonomic symptoms. These patterns underscore the need to treat screen exposure and sedentary behavior as significant occupational health concerns in the digital workplace. Implementing ergonomic, behavioral, and organizational interventions is essential for promoting employee well-being.

8. LIMITATIONS

- Limited to urban IT employees; results may not generalize to rural or non-IT populations.
- Reliance on self-report measures may introduce recall bias.
- Cross-sectional design prevents causal interpretation.
- HRV subset had insufficient sample size for analysis.

9. FUTURE DIRECTIONS

- Longitudinal studies should examine changes in HRV and well-being over time.
- Controlled intervention studies on blue light filters, break reminders, and ergonomic designs are recommended.
- Inclusion of objective measures (wearables, screen-use trackers) will strengthen future work.
- Studies comparing remote vs office IT employees may reveal contextual differences.

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