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Article

The Effect of Screen Exposure on Lecturer Health with Workload Mediation at the Indonesian University of Science and Technology

Sri Utami Rizta[1*], Tarbiyah Nurjanah[2,] and Mona Syafriani[3]
[1,2]Informatika Medis, Universitas Sains dan Teknologi Indonesia
[3]Manajemen Bisnis Internasional, Universitas Sains dan Teknologi Indonesia

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E-mail: [a] sriutamirizta@usti.ac.id, [b] tarbiyahnurjanah@usti.ac.id, [c] monasyafriani@usti.ac.id

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A B S T R A C T

The increasing use of digital technology in higher education has intensified screen exposure among lecturers, potentially increasing workload and contributing to adverse health outcomes. This study examines the effect of screen exposure on lecturers' health deterioration, with workload as a mediating variable, at the Indonesian University of Science and Technology. A quantitative causal-associative design was employed using a census method involving 65 permanent lecturers. Data were collected through an online questionnaire and analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS). The analysis included validity and reliability testing, coefficient of determination (R^2), predictive relevance (Q^2), and hypothesis testing. The results indicate that screen exposure has a positive and significant effect on workload and a significant effect on adverse health outcomes among lecturers. However, workload does not have a significant direct effect on adverse health outcomes and does not mediate the relationship between screen exposure and health. These findings suggest that health deterioration associated with screen exposure occurs primarily through direct physiological and visual mechanisms rather than through workload. The model demonstrates strong explanatory and predictive power. This study contributes empirical evidence on digital screen exposure and occupational health risks in Indonesian higher education and provides practical implications for ergonomic interventions and screen time management policies.

1. Introduction

The rapid digitalization of higher education has fundamentally transformed lecturers' work patterns, resulting in prolonged and intensive exposure to digital screens. Lecturers are now required to engage continuously with computers, laptops, and mobile devices for teaching, assessment, research, and administrative tasks (Fibriasari et al., 2023). While digital technology enhances efficiency and flexibility, excessive screen exposure has been increasingly associated with adverse health outcomes, particularly visual fatigue, musculoskeletal complaints, sleep disturbances, and psychological strain (Bernadette & Rasyid, 2023).

Previous studies have consistently reported that prolonged screen exposure contributes to Digital Eye Strain (DES), also known as Computer Vision Syndrome, characterized by symptoms such as eye fatigue, dryness, blurred vision, and headaches (Kaur et al., 2022). In addition to visual problems, extended screen use has been linked to non-ergonomic working postures, leading to neck, shoulder, and back pain, as well as reduced work comfort (Beeson et al., 2024). Moreover, continuous digital engagement has been shown to increase cognitive demands and psychological pressure, especially in academic environments that require high responsiveness and multitasking.

Alongside screen exposure, the concept of digital workload has emerged as a critical factor in modern academic work. Digital workload refers to additional work demands arising from the intensity of technology use, including multitasking across multiple platforms, constant connectivity, rapid information processing, and the need for continuous technological adaptation. Empirical evidence suggests that excessive digital workload is closely related to technostress, mental fatigue, work–life imbalance, and declining well-being among lecturers. However, findings regarding the direct impact of workload on health outcomes remain inconsistent across studies.

Despite the growing body of literature on screen exposure, digital workload, and occupational health, the research gap in this field remains implicit and insufficiently articulated. Most existing studies examine these variables separately or focus on direct relationships, without adequately explaining the underlying mechanisms linking screen exposure to health outcomes. In particular, there is a lack of empirical studies that explicitly examine the mediating role of workload in the relationship between screen exposure and lecturers' health. Whether increased screen exposure affects health indirectly through heightened workload, or primarily through direct physiological and visual mechanisms, has not been conclusively established.

Furthermore, only a limited number of studies have integrated screen exposure, workload, and health simultaneously within a single Structural Equation Modeling (SEM) framework, especially in the context of higher education in developing countries. Most prior research relies on bivariate or regression-based approaches, which may not sufficiently capture the complex and multidimensional relationships among these variables. This limitation restricts a comprehensive understanding of how digital work demands operate as an interconnected system influencing lecturers' health.

In the Indonesian higher education context, this research gap is particularly evident. Post-pandemic digital adaptation has significantly increased lecturers' reliance on digital technologies, yet empirical evidence examining the combined effects of screen exposure and digital workload on health remains scarce. Addressing this gap is crucial for developing evidence-based occupational health strategies tailored to academic institutions.

Therefore, this study aims to examine the effect of screen exposure on lecturers' health with workload as a mediating variable, using a Structural Equation Modeling–Partial Least Squares (SEM-PLS) approach. By integrating screen exposure, workload, and health into a single analytical model, this study seeks to provide a more comprehensive explanation of the pathways through which digital work affects lecturers' health. The findings are expected to contribute theoretically by clarifying the mediating role of workload and methodologically by offering an integrated SEM model, as well as practically by informing institutional policies on ergonomic management, screen time regulation, and occupational health promotion in higher education.

2. Literature Review

2.1 Screen Exposure

Screen exposure refers to the duration, frequency, and intensity of interaction with

digital devices such as laptops, smartphones, and tablets. In higher education settings, particularly in post-pandemic Indonesia, lecturers' work has become highly dependent on screen-based activities, including online teaching, academic administration, assessment, and digital communication. This intensive use of digital devices has significantly increased screen exposure among lecturers (An et al., 2025)

From an ergonomic perspective, screen exposure should not merely be understood as a work habit, but as an ergonomic risk factor, particularly within the domain of visual ergonomics. Visual ergonomics focuses on the interaction between visual demands and workplace conditions, including screen lighting, viewing distance, screen height, posture, and duration of exposure, all of which influence visual comfort and physiological stray (Dessy Widhya Putri, 2018).

Prolonged exposure to screens requires continuous visual adaptation to artificial lighting and display characteristics. When screen brightness, contrast, viewing distance, or ambient lighting are not ergonomically optimized, the visual system experiences increased strain, leading to symptoms of Digital Eye Strain (DES) or Computer Vision Syndrome (CVS) (Kaur et al., 2022). These conditions are experienced by more than half of digital device users and are characterized by eye fatigue, dryness, blurred vision, and headaches.

InapproMante viewing distance and screen positioning, combined with prolonged static postures during screen-based work, further exacerbate ergonomic risk. Studies indicate that non-ergonomic screen height and prolonged sitting postures contribute not only to visual discomfort but also to musculoskeletal strain, particularly in the neck, shoulders, and upper back (Gushgari et al., 2024). Thus, screen exposure simultaneously generates visual, postural, and cognitive ergonomic demands.

Beyond visual symptoms, excessive screen exposure also affects sleep quality and psychological well-being. Increased exposure to digital screens, especially without adequate rest intervals, disrupts circadian rhythms and contributes to mental fatigue and work-related stress (Patimah & Yunita, 2024). The rapid digital transformation in academic work has intensified screen-based demands, blurring work–life boundaries and increasing digital fatigue among lecturers (An et al., 2025).

Therefore, screen exposure represents a multidimensional ergonomic risk factor encompassing visual strain, postural load, and cognitive demand. Understanding screen exposure through a visual ergonomics framework is essential to explain its potential impact on workload and health outcomes among lecturers

2.2 Digital Workload

Digital workload is an additional demand arising from the use of technology in daily work. This aspect includes the number of platforms, the intensity of digital-based tasks, excessive connectivity (always-on), and new skills that must be mastered. Lecturers are not only required to teach, but also to attend online meetings, fill out online reports, and interact with students on various applications. Techno-overload and techno-insecurity reduce lecturer performance, indicating that digital workload is an important factor in work quality (Rizqi Amalia et al., 2023)

This phenomenon is closely related to technostress. (Tu et al., 2025) shows that lecturers and teachers face fatigue due to digital pressure, which impacts job satisfaction and potential burnout. In Indonesia, research by Fajar Eryanto Septiawan, (2025) revealed that the level of technostress among teaching staff is influenced by technological efficacy, mental workload, and psychological resilience. The higher the digital demands, the greater the risk of stress experienced by lecturers.

In addition, digital workload also affects work-life balance. High digital demands make it difficult to separate work and personal time. Baskoro et al., (2025) found similar results, mentioning that lecturers and students experienced a decline in mental health due to continuous digital demands, especially after the pandemic. Thus, digital workload can be understood as a significant stress factor, affecting the physical, psychological, and quality of life of educators.

2.3 Impact on lecturers' health

Screen exposure and digital workload have a direct impact on lecturers' health, including visual, musculoskeletal, sleep, and psychological aspects. From a visual perspective,

the intensity of screen use causes complaints of eye fatigue, dryness, and blurred vision. These symptoms are very common among students and lecturers. This is in line with Kaur et al., (2022), who found a high prevalence of Digital Eye Strain among academic workers.

Musculoskeletal aspects are also a serious problem. Prolonged static sitting positions cause neck, shoulder, and back pain. The high prevalence of work-related musculoskeletal disorders (WMSDs) among digital workers. In Indonesia, Rizqi Amalia et al., (2023) also noted that lecturers reported increased physical complaints due to digital workload, especially during the pandemic period.

The psychological impact is no less important. Fajar Eryanto Septiawan (2025) found that excessive exposure to technology causes mental fatigue, while (Tu et al., 2025)emphasized that technostress correlates with burnout and decreased job satisfaction. Baskoro et al. (2025)also added that digital fatigue reduces academic enthAgesm and motivation. Thus, it is clear that screen exposure and digital workload affect the well-being of lecturers in multiple dimensions.

2.4 Framework

a. The Effect of Screen Exposure on Workload

Prolonged exposure to computer screens can cause visual fatigue such as strained eyes, blurred vision, and physical discomfort, which ultimately leads to increased workload (Dessy Widhya Putri, 2018). The longer you use a computer, the higher the risk of severe digital eye strain (DES) (Gushgari et al., 2024). Prolonged screen use increases cognitive load, triggers visual stress, and impacts work performance, reinforcing evidence that screen exposure duration significantly affects increased workload(Beeson et al., 2024).

H1 : Screen exposure has a positive effect on increasing workload

b. The Effect of Workload on Health

High workloads can trigger physical, mental, and emotional stress that affects workers' health (Aprilia et al., 2024). Heavy work demands are also associated with increased work stress, sleep disturbances, and psychosomatic complaints (Castro-Medina et al., 2025). Increased workloads due to technological demands and the intensity of digital work have the potential to reduce recovery time, disrupt work-life balance, and ultimately increase the risk of physical and mental health disorders among workers (Bencsik & Juhasz, 2023). In the long term, chronic workloads can contribute to prolonged fatigue and a decline in workers' cognitive function (Dragano & Lunau, 2020).

H2 : Workload affects health

c. The Effect of Screen Exposure on Health Mediation of Workload

Workload acts as a mediator that explains how screen exposure affects lecturers' health. Prolonged screen exposure increases visual, cognitive, and postural demands, thereby increasing the perceived workload (Bernadette & Rasyid, 2023). This increased workload then triggers visual fatigue, musculoskeletal complaints, and reduced physical comfort, which can lead to health problems (Wardani et al., 2024). These behaviors are key pathways linking screen exposure to declining health among lecturers.

H3 : Screen exposure affects health mediated by workload

d. The Effects of Screen Exposure and Workload on Health

Excessive screen exposure combined with high workloads can simultaneously reduce lecturers' health. Prolonged screen exposure increases visual stress and symptoms of Computer Vision Syndrome, such as dry eyes and neck strain (Kaur et al., 2022). Heavy workloads also exacerbate physiological and psychological stress, leading to fatigue and musculoskeletal complaints (Naserian et al., 2024). International findings confirm that the combination of screen exposure and repetitive workloads increases the risk of long-term health problems for digital workers (de Lima Nardin et al., n.d.)

H4: Simultaneous screen exposure and workload negatively affect health

The conceptual framework for this study can be seen in Figure 1 below:

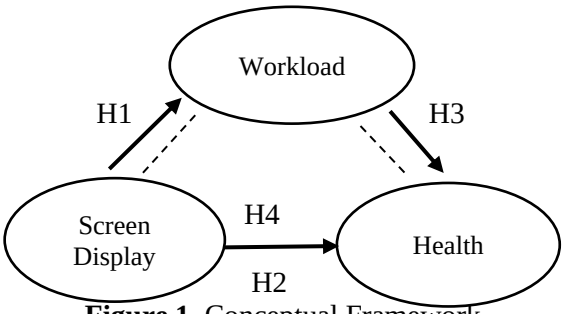

Figure 1. Conceptual Framework

3. Research Methodology

3.1 Location and Research Design

This study applies a causal associative design with a quantitative approach. The research was conducted at the Indonesian University of Science and Technology from February to April 2025. The population comprised all 65 permanent lecturers, and a census sampling method was employed. Primary data were collected through an online questionnaire distributed via Google Forms.

Data analysis was conducted using Structural Equation Modeling–Partial Least Squares (SEM-PLS) with SmartPLS software. SEM-PLS was selected for several reasons. First, it is suitable for studies with a relatively small sample size, as it does not require strict assumptions of multivariate normality. Second, SEM-PLS is approMante for predictive and exploratory research models, particularly when examining complex relationships involving mediating variables. Third, this method allows simultaneous analysis of measurement and structural models, making it effective for assessing both direct and indirect effects among screen exposure, workload, and health variables. Therefore, SEM-PLS is considered an approMante analytical approach to achieve the objectives of this study.

3.2 Population and Sample

The population in this study was all permanent lecturers at the Indonesian University of Science and Technology, totaling 65 lecturers.

4. Results and Discussion

4.1 Respondent Description

The results of the questionnaire administered to 65 respondents show the characteristics listed in Table 1. Based on gender, 35 respondents (54%) were male, while 30 respondents (46%) were female. In terms of age group, the largest number of respondents were in the 31–40 age range, namely 29 people (45%), while the <30 age group was the smallest with 9 respondents (14%). In terms of education, the majority of lecturers had a master's degree, namely 58 people (89%), and only 7 people (11%) had a doctoral degree. In terms of length of service, most lecturers had worked at the Indonesian University of Science and Technology for less than 5 years, namely 28 people (43%), while the group with more than 20 years of service numbered 14 people (21%).

Table 1 Respondent Characteristics

Description		Percentage
Gender	Man	54%
	Women	46%
Age	<30 Years	14%
	31-40	45%
	Years	18%
	41-50	23%
	Years	
	>50 Years	
Education	S2	11%
	S3	89%
Length of	<5 Years	43%
work	5-10 Years	21%
	11-20	14%
	Years	22%
	>20 Years	

4.2 Questionnaire Analysis Test

Table 2 shows the findings of the construct validity and reliability tests conducted for this study
using the SmartPLS software.

Table 2. Validity and Reliability

	Cronbach's Alpha	Rho_A	Composite Reliability	Average Variance Extracted (AVE)
Beban Kerja	0.949	0.953	0.957	0.689
Kesehatan	0.957	0.959	0.963	0.724
Paparan Layar	0.886	0.904	0.907	0.502

Based on Table 2, the measurement of the validity and reliability of the SEM-PLS construct is described as follows:

a. The reliability of the outer model is evaluated through convergent validity and discriminant validity, as well as by assessing the reliability of the construct measured using Cronbach's alpha values from the indicator table that measures the construct. A construct is considered reliable if the Cronbach's alpha value is greater than 0.60. The model shows that the Cronbach's alpha value for all constructs is above 0.60, indicating that all constructs are reliable according to the minimum threshold required.
b. Composite Reliability is another measure of construct reliability in the outer model. The composite reliability values for all constructs in the model exceed 0.70, which means that all constructs meet the minimum reliability requirements.
c. Average Variance Extracted (AVE) is used to evaluate discriminant validity by examining whether the square root of AVE for each construct is greater than the correlation between the two constructs in the model. The table shows that the AVE values for all constructs are above 0.50, indicating good discriminant validity. Thus, there are no problems with convergent validity in the model, and the constructs in this study can be said to have good discriminant validity.

4.3 Goodness of Fit Model

Goodness of fit Model is used to determine the ability of endogenous variables to explain the diversity of exogenous variables or, in other words, to determine the contribution of exogenous variables to endogenous variables. Goodness of fit Model in PLS analysis is performed using Q-Square Predictive Relevance (Q2). The results of Goodness of fit Model are shown in Table 3 below:

Table 3. Goodness of Fit Model

Variable	R^2
Workload	0.609
Health	0.676
$Q^2 = 1 – [(1 – R_2{}^2) (1 – R_2{}^2)]$	
$Q^2 = 1 – [(1 – 0.609) (1 – 0.676)] = 0.873$	

The structural model evaluation shows that the R^2 value for workload is 0.609, indicating that 60.9% of the variance in workload is explained by the exogenous constructs, while the remaining 39.1% is attributable to factors outside the model. Furthermore, the R^2 value for health is 0.676, suggesting that 67.6% of the variance in workers' health conditions is accounted for by the proposed model, with 32.4% explained by other unexamined variables.

The assessment of predictive relevance yields a Q^2 value of 0.873, demonstrating strong predictive capability of the model, as 87.3% of the combined variance in workload and health is explained simultaneously by the structural relationships. These results confirm that the model exhibits high explanatory and predictive power, thereby providing robust empirical support for the hypothesized relationships and justifying further interpretation of the structural path coefficients.

Figure 2 shows the PLS model for this study :

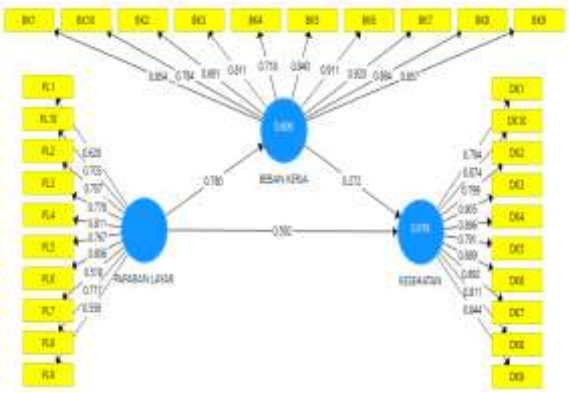

Figure 2. PLS Model

This model consists of three constructs: Workload, Screen exposure, and Health as shown in Table 3. The assessment of the validity and reliability of each construct is the objective of the measurement model evaluation stage.

Table 4. Hypothesis Test Results

No	Variabel	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
1.	Beban Kerja-> Kesehatan	0.272	0.244	0.221	1.233	0.218
2.	Paparan Layar -> BebanKerja	0.780	0.798	0.054	14.507	0.000
3.	Paparan Layar -> Kesehatan	0.592	0.619	0.171	3.468	0.001

The effect of workload on health

The results of the analysis show that the effect of workload on health is not significant, with a t-statistic value of 1.233 (less than 1.96) and a significance level of p = 0.218 (> 0.05). Thus, hypothesis H1 is rejected. These findings indicate that in the context of this study, workload does not have a significant direct effect on workers' health. These results differ from several previous empirical findings that generally show a relationship between workload and physical and psychological health outcomes. Research in the context of occupational health emphasizes that workload, especially when it involves high mental and physical demands, correlates with fatigue and stress that affect overall health for example, through increased physical and psychological fatigue and intolerance to work demands, leading to a decline in occupational fatigue and workers' cognitive abilities. These findings underscore the importance of workload management strategies in reducing the risk of long-term health disorders (Ahmadi et al., 2022)

The effect of screen exposure on workload

The hypothesis test results show that screen exposure has a positive and significant effect on workload (β = 0.780, t = 14.507, p < 0.001), thus accepting H2. These findings indicate that higher digital screen exposure is associated with greater workload in respondents. This finding is in line with previous studies that reported a significant relationship between screen time duration and digital burnout, which contributes to higher psychological stress and mental workload in individuals who frequently use digital devices (Ibrahim et al., 2025). Additionally, the study by (Tekeci et al., 2024) found that excessive screen exposure is associated with an increase in screen dependency indicators and changes in sensory processing, which are also associated with higher cognitive load.

The effect of screen exposure on health

The structural model analysis indicates that screen exposure significantly influences health outcomes (β = 0.592, t = 3.468, p = 0.001), supporting H3. This result suggests that prolonged exposure to digital screens is associated with adverse health consequences among respondents. These findings align with existing evidence demonstrating that high screen time is linked to multiple negative health outcomes, including visual strain, sleep disturbances, and somatic symptoms (Devi & Singh, 2023; Piszka et al., 2025).

Table 5. Indirect Effect Test Results

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
PAPARAN LAYAR -> BEBAN KERJA_ -> KESEHATAN	0.212	0.196	0.180	1.182	0.238

The effect of screen exposure on workload with health mediation

The indirect effect analysis revealed that workload did not significantly mediate the relationship between screen exposure and health (β = 0.212, t = 1.182, p = 0.238). This finding suggests that the impact of screen exposure on health is more likely to occur through direct mechanisms such as visual strain and physiological stress rather than through perceived workload. These results are consistent with previous studies emphasizing the direct health consequences of prolonged screen exposure, including digital eye strain and sleep disturbances (Dhakal et al., 2022; Wong et al., 2023).

5 Conclusion

This study aimed to examine the effect of screen exposure on lecturers' health with workload as a mediating variable at the Indonesian University of Science and Technology. The findings demonstrate that screen exposure plays a significant role in shaping both workload and health outcomes among lecturers. Specifically, screen exposure has a strong and positive effect on workload, indicating that prolonged interaction with digital devices increases perceived work demands. In addition, screen exposure was found to have a direct and significant impact on health, suggesting that extended screen use contributes to adverse health conditions such as visual strain, physiological discomfort, and reduced well-being.

In contrast, workload did not show a significant direct effect on health, nor did it significantly mediate the relationship between screen exposure and health. These results

indicate that the negative health effects associated with screen exposure are more likely to occur through direct physiological and visual mechanisms rather than indirectly through perceived workload. This finding highlights the importance of distinguishing between direct and indirect pathways when examining digital work-related health risks.

Overall, the proposed model demonstrates strong explanatory and predictive power, as evidenced by high R^2 and Q^2 values, confirming the robustness of the structural relationships. The study contributes to the growing body of literature on digital workload and occupational health in higher education, particularly within the Indonesian context, where empirical evidence remains limited. Practically, these findings underscore the need for institutions to implement preventive strategies, such as ergonomic interventions, screen time management, and regular visual rest, to protect lecturers' health in increasingly digital work environments. Future research is encouraged to incorporate additional mediating or moderating variables, such as ergonomics, technostress, or individual coping strategies, and to expand the sample scope to enhance generalizability.

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