

TECHNOSTRESS AMONG UNIVERSITY MEDICAL STAFF MEMBERS; A CROSS-SECTIONAL STUDY

By

El-Saka SF¹, Elmetwaly MMF¹, Elsherbeny EEA¹, El-Khawaga GO¹ and El-Helaly M^{1,2}

¹Department of Public Health and Community Medicine, Faculty of Medicine, Mansoura University, Egypt,

² Department of Clinical Medical Science, Faculty of Medicine, New Mansoura University,

New Mansoura City, Egypt

Corresponding Author: El-Saka S. **E-mail:** salwaelsaka@mans.edu.eg

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Abstract

Introduction: Technostress is an emerging type of stress affecting various sectors including students, teachers, and university medical staff members. Although technology has many blessings, technostress was described as the dark side of technology use.

Aim of Work: To assess the technostress creators and productivity relative to various factors among university medical staff members. **Materials and Methods:** A cross-sectional study was carried out on 136 medical staff members from Mansoura University. A questionnaire, developed by google form, was sent to the emails of all the selected university medical staff members. The questionnaire included questions about socio-demographic data and a section to assess the technostress creators and the degree of productivity. The last section measured the technostress related symptoms among the studied group including neck ache, headache, blurred vision, sleep problems, anxiety, irritability, poor appetite, fatigue, increased level of mental load, time pressure and frustration.

Results: University medical staff members had a moderate level of techno-overload, techno-invasion and academic productivity. Wi-Fi quality, information and communication technology (ICT) experience years and hours spent using technology devices had significant effect on some of the technostress creators and as well on productivity. The prevalence of technostress symptoms in the study participants were time pressure (59.6%), headache (57.4%), blurred vision (55.1%) and neck ache (50.7%). **Conclusion and Recommendations:** The studied sample experienced a considerable level of technostress which affected their productivity. High quality internet services fulfilling their needs, provision of training courses, and availability of technical support are measures that could help the university staff to prevent and control their technostress and subsequently improving their productivity.

Keywords: Technostress; Creators; University staff; Productivity and Stress symptoms.

Introduction

Since COVID 19 was declared as a global pandemic in early 2020, preventive public health measures have been taken by all governments to reduce the number of deaths. Entire countries applied lockdown. Therefore, universities were forced to discontinue traditional face-to-face learning (World Health Organization, 2020). Thus, higher education institutions shifted to online courses specially in medical faculties (Cao et al., 2020). The work environment was affected a lot by the COVID- 19 pandemic and its associated lockdown. Work could be preceded by some workers as lectures from home using technology. Undoubtedly, internet and technology were fundamental for protecting jobs of the employees from this pandemic (Garrote Sanchez et al., 2021).

Unfortunately, technology has a dark side named technostress that was first introduced by Craig Brod, the American Psychologist. He discussed the effect of technology on psychology causing stress. Thus, he defined technostress as “a modern disease of adaptation caused by an inability to cope with new computer technologies in a healthy manner” (Brod, 1984).

Day after day, the dependence on ICT (information and communication technology) is increasing dramatically, updates of software and hardware are introduced continuously, complex ICT skills differ greatly between workers, and ultimately work environment became basically dependent on modern ICT (Brown et al., 2014). Some of these technologies including Microsoft Teams, Zoom, WhatsApp, were introduced for learning and teaching (Govender and Khoza, 2022). So, technostress remained a big difficult problem. It is generally manifested as work exhaustion (Turel and Gaudio, 2018), emotional exhaustion (Tarafdar et al., 2019), frustration and anxiety (Tagurum et al., 2017).

There are five variables that cause technostress called techno stressors: techno- overload, techno complexity, techno- invasion, techno-insecurity, and techno-uncertainty (Tarafdar, 2007). On the other hand, there are some variables that could decrease technostress (Technostress inhibitors) as technical training (Upadhyaya and Vrinda, 2021), and support (La Torre et al., 2019). Previous research suggested negative impact of technostress on the work life of individuals: dropped

performance (Brooks and Califf, 2017), increased work stress (Tarafdar, 2007), dropped job satisfaction (Yin et al., 2018), decreased engagement of employees (Okolo et al., 2013), up to intention to job turnover (Harris et al., 2022). At the time of writing this paper and to the best of our knowledge, few studies investigated technostress among university medical staff members especially at Mansoura University.

Aim of Work

To assess the technostress creators and productivity relative to various factors, among university medical staff members in Faculty of Medicine, Mansoura University, Egypt.

Materials and Methods

Study design: It is a cross-sectional study.

Place and duration of study: Faculty of Medicine, Mansoura University - Egypt. The study

was conducted from September 1st to December 30th, 2022.

Study sample: University medical staff members (a total of about 2138) of Faculty of Medicine, Mansoura University. Using technostress

prevalence rate of 10% according to (Tagurum et al., 2017), confidence interval of 0.95, an absolute standard error (alpha) of 0.05, power of 0.80 (1- B error probability) and a standard normal deviation of 1.96, a minimum sample size of 130 for university medical staff members was calculated using Open Source Epidemiologic Statistics for Public Health (Open Epi Version 3.01 (Charan and Biswas, 2013). The sample size was increased by 10% to be at least 143 for university medical staff members allowing for non-responders and dropouts.

A simple random sample of 143 participants was collected using computer from the total list of the emails of all university medical staff members of Faculty of Medicine, Mansoura University.

Study methods:

A self-structured questionnaire was developed by google form, and was sent to the university emails of all the selected university medical staff members (total number of 143). The questionnaire included three parts.

-The first part included questions concerning sociodemographic characteristics of the studied group,

their experience using ICT and the availability of Wi-Fi in their work environment.

- **The second part** used techno stress instrument developed and validated by Ragu-Nathan et al. (2008) and comprised of 5-point Likert scale measurement of technostress creators including techno-overload, techno-invasion, techno-complexity, techno insecurity and techno-uncertainty. Respondents rated the items on 5-point Likert scales that range from 1 (strongly disagree) to 5 (strongly agree), and higher total scores indicate greater technostress.

Techno-overload is defined as the effect of technology that forces university staff members to work faster and longer.

Techno-invasion is defined as the effect of technology that forces university staff members to work beyond regular college hours and invades their personal lives.

Techno-complexity is defined as a situation where technology makes university staff members feel that their skill sets are inadequate.

In the context of higher education, techno-insecurity is defined as the

situation where the university staff members feel threatened about poor academic performance compared to others who have a better knowledge of using technology.

Techno-uncertainty refers to a situation where frequent changes and upgrades in technology create uncertainty for the studied members.

-**The third part** of the questionnaire measured the technostress related symptoms among the studied group including: neck ache, headache, blurred vision, sleep problems, anxiety, irritability, poor appetite, fatigue, increased level of mental load, time pressure and frustration (La Torre et al., 2019).

Consent

Informed written consent was obtained from all university medical staff members who agreed to participate in the study.

Ethical Approval

The study was approved by the Institutional Research Board (IRB), Faculty of Medicine - Mansoura University with a code number of R.22.07.1752.

Data Management

The collected data was coded, processed and analyzed using Statistical Package for Social Sciences (SPSS) program (version 17) for windows. Quantitative data was presented using means and standard deviations. While qualitative data was presented using frequency tables, percentages and

charts. Tests of statistically significant relationships were carried out using Chi-square test for qualitative data, and Student-t test and One way Analysis of Variance (ANOVA) for quantitative data. Pearson correlation test was used to test significant linear relations between numeric variables. A 95% confidence

Results

Only 136 of the selected 143 university medical staff members accepted to participate in the study (participation rate of 95.1 %)

Table 1: Sociodemographic characteristics of the studied participants (No = 136)

Socio-demographic characteristics	Total No (136) No	%
Age:		
- 20-	- 14-	- 10.3
- 30-	- 40-	- 29.4
- 40-	- 46-	- 33.8
- 50-	- 25-	- 18.4
- ≥60	- 11-	- 8.1
Gender		
Male	- 83	- 61.0
Female	- 53	- 39.0
Residence		
Urban	- 16	- 11.8
Rural	- 120	- 88.2
Academic grade:		
Demonstrator to	- 26	- 19.1
Assistant Lecturer	- 59	- 43.4
Lecturer to Assistant	- 51	- 37.5
Professor		
Professor		

Department type:		
Academic	- 71	- 52.2
Clinical	- 65	- 47.8
Years of experience using ICT#		
- < 5	- 25	- 18.4
- 5 to 10	- 38	- 27.9
- >10	- 73	- 53.7
Hours spent using technology devices per day		
- < 5	- 56	- 41.2
- 5 to 10	- 70	- 51.5
- >10	- 10	- 7.4
Wi Fi quality in work environment		
- Poor	- 84	- 61.8
- Good	- 52	- 38.2

#:ICT: Information and communication technology

The majority of the studied participants belonged to the age group 30-40 years, were males (61%) and lived in rural areas (88.2%). About 43% were lecturer to assistant professor, 35.7% were professors and only 19.1% were demonstrator to assistant lecturer. Nearly half of the participants (52.2%) worked in academic departments and the other half worked in clinical departments. About half of the studied participants (53.7%) had more than ten-years experience using ICT and spent 5-10 hours per day using a technology device. More than the third (38.2%) of the studied participants reported availability of good Wi Fi in their work environment (Table 1).

interval was used and probability values of < 0.05 were considered statistically significant. The means of the technostress creators and productivity were classified according to the following scale (Abo Mokh et al., 2021) to represent the estimation level of the staff members' responses: very high (4.5 and more); high (4 – 4.49); moderate (3.50–3.99); low (3- 3- 3.49); and very Low (less than 3).

Table 2: Levels of technostress creators and productivity among the studied participants (No = 136)

Items	Mean	SD#	Level
Technostress creators			
Techno-overload	3.69	± 0.70	Moderate
Techno-invasion	3.96	± 0.77	Moderate
Techno-complexity	2.87	± 0.81	Very low
Techno-insecurity	2.98	± 0.58	Very low
Techno-uncertainty	3.05	± 0.86	Low
Productivity	3.92	± 0.73	Moderate

#: SD: Standard deviation

Among all the technostress creators, both techno-overload and techno-invasion had a moderate level among the studied participants (3.69 ± 0.70 and 3.96 ± 0.77 respectively). However, techno-uncertainty had a low level (3.05 ± 0.86) and both techno-complexity and insecurity had a very low level among them (2.87 ± 0.81 and 2.98 ± 0.58 , respectively). On the other hand, the productivity of the studied

Table 3: Technostress creators and productivity (Mean and SD) among the studied participants according to occupational factors (No = 136).

Factors	Technostress creators					Productivity (Mean ± SD)
	Techno-overload (Mean ± SD)	Techno-invasion (Mean ± SD)	Techno-complexity (Mean ± SD)	Techno-insecurity (Mean ± SD)	Techno-uncertainty (Mean ± SD)	
Academic Grade:						
-Demonstrator to Assistant Lecturer	3.66±0.62	4.02±0.95	2.88±0.72	2.89±0.35	2.76±0.85	3.83±0.51
-Lecturer to Assistant Professor	3.70±0.68	4.03±0.69	2.82±0.83	2.92±0.59	2.95±0.89	3.97±0.78
-Professor	3.69±0.76	3.84±0.77	2.91±0.85	3.08±0.64	3.32±0.76	3.91±0.78
-Professor	0.959	0.421	0.843	0.239	0.011*	0.720
P value ^a						
Department type:						
Academic	3.68±0.71	4.12±0.78	2.77±0.81	2.89±0.62	2.99±0.82	3.93±0.73
Clinical	3.71±0.69	3.78±0.72	2.97±0.81	3.07±0.51	3.12±0.89	3.91±0.74
P value ^b	0.793	0.009*	0.157	0.063	0.367	0.862
Wi Fi quality in work environment						
Poor	3.75±0.63	3.94±0.78	2.98±0.79	2.95±0.55	2.87±0.87	3.79±0.71
Good	3.60±0.79	3.98±0.77	2.69±0.82	3.02±0.61	3.34±0.76	4.12±0.72
P value ^b	0.212	0.812	0.045*	0.483	0.002*	0.008*
Years of experience using (ICT)						
< 5	3.53±0.739	3.78±0.79	3.32±0.62	3.15±0.51	2.77±0.64	3.44±0.92
5 to 10	3.73±0.68	4.04±0.73	2.96±0.76	2.98±0.50	3.02±0.80	3.80±0.58
>10	3.73±0.69	3.97±0.78	2.67±0.83	2.91±0.63	3.16±0.94	4.14±0.64
P value ^a	0.436	0.413	0.001*	0.20	0.146	0.000*
Hours spent using a technology device per day						
< 5	3.49±0.57	3.69±0.76	3.12±0.85	3.07±0.64	3.10±0.77	3.68±0.84
5 to 10	3.85±0.68	4.13±0.72	2.70±0.72	2.94±0.51	3.04±0.89	4.05±0.60
>10	3.66±1.10	4.15±0.75	2.60±0.77	2.60±0.43	2.77±1.05	4.25±0.47
P value ^a	0.01*	0.004*	0.007*	0.04*	0.54	0.005*

^a: ANOVA was used for statistical analysis Probability was significant if less than 0.05

^b: Student-t test was used for statistical analysis

*: Statistically significant

participants showed a moderate level (3.92 ± 0.73) (Table 2).

The age of studied participants was stratified into 5 ten-year groups (20- ≥ 60). Across all technostress creators and productivity, no statistically significant differences were found regarding age and residence as well. Female university medical staff members had higher mean techno-insecurity, while males had higher mean techno-invasion with statistical significance (non-tabulated data).

Concerning technostress creators' means of different academic grades of the studied participants, only professor had significant statistically higher mean of techno-uncertainty compared to other academic grades. Moreover, professors had higher means of both techno-complexity and techno-insecurity, but the difference was not statistically significant.

As regards the type of the department, the studied participants who worked in academic departments had a significant higher means of techno-invasions compared to those in clinical department. On the other hand, study participants worked in clinical departments had higher means of techno-insecurity compared to those in academic departments. Moreover, other technostress creators did not show significant differences between who worked in academic or clinical departments.

Regarding Wi Fi quality in the work environment, study participants who had poor Wi Fi, had a significant higher means of techno-complexity but lower mean of techno-uncertainty compared to those who had good Wi Fi (p value < 0.05). Techno-complexity mean was statistically significantly higher among study participants who had less than 5 years experience in using ICT.

Concerning productivity, study participants who had good Wi Fi, experience of using ICT more than 10 years and spent more than 10 hours per day using a technology device per day (> 10 hours), had higher means of productivity (p value 0.008, 0.000, 0.005 respectively). However, means of productivity did not show significant difference among the study participants according to type of department and academic grades Table (3).

Table (4): Correlation between technostress creators and productivity among the studied participants:

Technostress creators (Means and SD)	Productivity Mean± SD: 3.92±0.73
	r (p)
Techno-overload (3.69± 0.70)	0.212 (0.01) *
Techno-invasion (3.96±0.77)	0.104 (0.23)
Techno-complexity (2.87±0.81)	-0.314 (0.00) *
Techno-insecurity (2.98±0.58)	-0.150 (0.08)
Techno-uncertainty (3.05±0.86)	0.142 (0.10)

*: Statistically significant

Table (4) showed that the productivity of the study participants had a significant positive correlation with the techno-overload among them. On the other hand, productivity had a significant negative correlation with techno-complexity. However, other technostress creators had no significant correlation with the productivity of the study participants.

Table 5: Prevalence of technostress related symptoms among the studied participants (No = 136)

Technostress related symptoms	No	%
- Neck ache	69	50.7
- Headache	78	57.4
- Blurred vision	75	55.1
- Sleep problems	49	36.0
- Anxiety	47	34.6
- Irritability	58	42.6
- Poor appetite	12	8.8
- Fatigue	58	42.6
- Increased level of mental load	58	42.6
- Time pressure	81	59.6
- Frustration	38	27.9

Concerning the prevalence of technostress related symptoms among the studied participants, time pressure was the most prevalent symptom (59.6%), followed by headache (57.4%) then, blurred vision (55.1%) and neckache (50.7%) (Table 5).

Discussion

One of the consequences of the global COVID-19 pandemic has been the dramatic changes to working environments globally. In 2020, for many employees, remote work using ICTs became a need rather than a luxury. Technostress has been described by scientists as the dark side of technology use (Ayyagari et al., 2011).

The current study aimed to assess the technostress creators and productivity relative to various factors, among university medical staff members in Faculty of Medicine, Mansoura University.

A study done on academic staff in a Nigerian university before COVID-19 pandemic studied the prevalence of technostress among Nigerian banking employees and found that 54.2% of the respondents admitted that they did experience technostress (Okonoda et al., 2017).

The studied participants had a moderate level of both techno-overload and techno-invasion, (Table 2). Comparably, Abo Mokh et al. (2021) found the same level of technostress among Palestinian English language teachers. Similarly, Chalapay et al.

(2021) found that Filipino teachers experienced technostress during COVID-19 crisis. They explained that the teachers moderately feel stressed using ICT in emergency distance education.

It was obvious that techno-invasion was the top creator of stress (3.69 ± 0.7) among the studied staff members (Table 2). This finding was in line with a study done in Egypt by Kasemy et al. (2022) with mean techno-invasion (3.74 ± 0.7), while Gabr et al. (2021) found that complexity of technology is the most stressful.

Males were significantly techno-invaded more than females among the studied group (non-tabulated data). This could be explained as male university medical staff members constituted 61% of our study sample.

In addition, staff members working in academic departments were significantly techno-invaded more than staff members in clinical departments. This might be elucidated that the clinical departments depended more on face-to-face teaching but academic departments conducted mostly using online methods which produced more stress among them compared to those who worked in the clinical departments.

Molino et al. (2020) blamed the work-at-home environment and at the same time expressed that universities are insisting on employees to continue working virtually, at least part-time, even after the lockdown is lifted.

Meanwhile, Gabr et al. (2021) found that female gender, practical education and being lecturer or higher were significantly associated with techno-invasion. Mishra et al. (2020) explained that the need for manipulation and laboratories in practical education makes practical subjects difficult to be taught online.

Moreover, techno-uncertainty was significantly higher among professors than other academic grades. Also, professors had higher means of both techno-complexity and techno-insecurity, but the difference was not statically significant (Table 3). Similarly, Marawan et al. (2021) found that senior participants with higher academic degrees were significantly associated with higher levels of the three domains of technostress (techno-overload, techno-invasion and techno-complexity).

The present study did not show any statistical significant difference among the participants concerning their

age (non-tabulated data). However, Tsertsidis et al. (2019) stated that older people have more negative attitudes towards the use of new technologies and feel less competent. Educators also have limited time and patience to address minor technical issues throughout the process of adjustment to new tools. Moreover, Hauk et al. (2018), reported that older adults have more difficulty using technology than younger ones, especially with techno-overload and techno-complexity, which necessitate a diverse set of cognitive abilities and physical condition.

Also, the studied staffs who were working with poor Wi Fi quality had significantly higher techno-complexity (Table 3). This was in agreement with Okonoda et al. (2017) from Nigeria who stated that a slow internet network was considered a factor contributing to technostress. In the same context, Gabr et al. (2021) showed that participants who did not have good Wi-Fi or modern computers had significantly higher mean overload, invasion, and complexity.

The studied participants who had good Wi Fi, experience more than 10 years, and using a technology device per day more than 10 hours had significantly

higher means of productivity (Table 3). These results were supported by Ismail et al. (2023) who reported that staff members who had good Wi Fi and the highest hours spent using a computer per day (≥ 9 hours) had higher means of productivity.

Techno-complexity's mean was statistically significantly higher among the studied participants who had the least years of experience using ICT (less than 5 years), compared to others who had more years of experience using ICT (Table 3). On the contrary to the current results, Okonoda et al. (2017) from Nigeria and Narasalagi et al. From India (2021) did not find any statistically significant relationship between years of computer usage by respondents and their technostress levels.

There was a significant negative correlation between productivity and techno-complexity, and an unexpected significant positive correlation between techno-overload and productivity among the studied group (Table 4). This was in line with Ismail et al. (2023) who found significant negative correlations between techno-complexity and techno-insecurity with productivity and with Le Roux and Botha (2021) who highlighted a significant negative correlation

between techno-complexity and productivity and declared unexpected positive correlation between techno-uncertainty and productivity.

The positive correlation between techno-overload and productivity among the studied group could be due to factors related to personality traits. Furthermore, this result might be explained by that; the staffs with high productivity tend to work longer than usual because ICTs create expectations for faster response, contributing to work overload.

The combination of intensive computer use and work demands has resulted in an increased incidence of illnesses (Tatafdar et al. 2007 and Tatafdar et al. 2014). Among the present study participants, time pressure, headache, blurred vision and neckache were the most prevalent technostress related symptoms (59.6%, 57.4% and 55.1%, respectively) (Table 5). Correspondingly, Tagurum et al. (2017) encountered neckache, blurred vision and information overload as the most prevalent technostress related symptoms (45.8%, 42.4%, and 31.3%, respectively) in their study on the effect of technostress on job performance and coping strategies among academic staff

of a tertiary institution in north-central Nigeria.

Limitations of the study: The current study had certain limitations including its cross-sectional design, so, longitudinal studies will be needed to clarify the causal relationships between the study variables. In addition, the study focused on just one group of those affected by over-use of technology in medical education during the pandemic of Covid-19. Technostress is a multifactorial phenomenon that can be induced by both environmental and personal factors; the study questionnaire did not include inquiries about the personality traits of the participants, subsequently, its effect on technostress was not evaluated. Moreover, the study did not assess the effects of coping strategies, whether adaptive or maladaptive, on technostress.

Conclusion

The studied university medical staff members had moderate level of techno-overload and techno-invasion, in addition to a moderate level of productivity. Wi Fi quality, years of experience using ICT and hours spent using technology devices had a significant effect on some of the technostress creators and the degree of

productivity among them. Also, gender, academic degree, department type had a significant effect on some of the technostress creators.

Recommendations

Providing the university medical staff members with high quality internet services, training, technical support and decreasing the working hours on technology devices, are recommended to prevent and control the technostress.

Conflict of interest

All authors declared no financial and personal relationships with other people or organizations that could inappropriately bias this work.

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