TECHNOSTRESS CONTRIBUTORS AMONG MEDICAL STUDENTS, A CROSS-SECTIONAL STUDY

By

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Abstract

Introduction: The use of technology in education and online learning is progressively increasing and this has its merits and demerits for medical students. One of the demerits is developing technostress which is characterized by anxiety and frustration. This certainly will affect students' wellbeing and performance. **Aim of Work:** To estimate the levels of different technostress creators among Mansoura University medical students and their associated factors. **Materials and Methods:** This is a cross-sectional study that was carried on a sample of 814 students from faculty of Medicine, Mansoura University, Egypt. A self-administered questionnaire was constructed using google form to inquire about sociodemographic data and technostress creators. The quality of Wi-Fi connection, daily hours of technology use, and duration of use by years, were also inquired about and considered in relation to different technostress creators. **Results:** Among the studied technostress domains, techno-uncertainty (3.35 ± 0.78), techno-invasion (3.29 ± 0.766) and techno-overload (3.15 ± 0.59), were the highest technostress creators among the students. More techno-overload was found in students with more daily hours of technology use. More techno-invasion was detected among students with longer years of Information and Communication Technologies (ICT) experience. Techno-insecurity was more among students with poor Wi-Fi connections. Students using technology for less than 5 hours daily had more techno-insecurity. **Conclusion and Recommendations:** Education using the current technological methods is associated with stress among medical students. Further studies can be performed to investigate the effects of students training on the use of ICT on decreasing

the associated technostress and improving students' performance.

Keywords: Technostress, Students, Creators, Information and Communication Technologies and Online learning.

Introduction

Information and Communication Technologies (ICT) are increasingly invading professional and personal life (Bondanini et al., 2020). Universities worldwide have been advancing their agendas for education enhanced by these technologies, such as promoting mobile learning, blended learning, and virtual reality-based instruction (Nimrod, 2022). The COVID-19 pandemic raised many challenges for university students, including the need to study from home, which resulted in a greater reliance on technology (Camacho and Barrios, 2022). While the benefits of technology cannot be argued, there has been increased interest in understanding the negative impact of technology on end-users (Borle et al., 2021). Technostress is a general feeling of anxiety and negative effect on thoughts, behaviors, attitudes, and body when a person is expected to deal with technology (Ioannou et al., 2022). Technostress can be caused by different factors such as the fast speed of technological change, deficiency of proper training, increased workload, lack of standardization with

technologies and the irregularity of hardware and software (Borle et al., 2021). It can lead to poor performance (Saleem et al., 2021). Moreover, there is a shortage of empirical studies that have examined the prevalence of technostress among the younger generation, in particular university students (Penado Abilleira et al., 2020). Technostress may place a great burden on the higher education institutions through a decrease in productivity, dropouts, and deviation from academic study (Pfaffinger et al., 2022). Therefore, there is a need to examine the prevalence of technostress among university students, in addition to study its consequences and its impact on academic productivity (Wang et al., 2021). Up to our knowledge, there are few studies about technostress among students in Mansoura ,Egypt. Hence, this study aims to investigate technostress and its creators among medical students.

Aim of work

To estimate the levels of different technostress creators among Mansoura University medical students and their associated factors.

Materials and Methods

Study design: It is a cross-sectional study.

Place, and duration of the study: The study was conducted on medical students, Mansoura University, Egypt, during November and December 2022.

Study sample: A convenience sample was obtained from medical students from Mansoura faculty of Medicine. A questionnaire was sent to 1000 medical students through their emails from 1st of November to 1st of December 2022. Those who agreed to participate (814 students) were then given directions on how to complete the questionnaire before being sent to the link for the Google form questionnaire (Response rate = 81.4 %).

Study methods: A self-administered questionnaire developed by goggle form was used. It included two parts; the first part inquired about sociodemographic characteristics of the students, their experience using ICT and the quality of Wi-Fi in their study environment, while the second part used the technostress instrument developed and validated by Ragu-Nathan et al., 2008. Questions about technostress creators included 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), where higher total scores indicate greater technostress (Ragu-Nathan et al., 2008). Strongly agree and agree answers were recoded into Severe technostress, Neutral into Moderate technostress, disagree and strongly disagree into Mild technostress, to express stress as Severe, Moderate and Mild as in the study performed by Abo Mokh et al. (2021). Techno-overload is defined as the effect of technology that forces students to work faster and longer (Ingusci et al., 2021). Techno-invasion is defined as the effect of technology that forces students to work beyond regular college hours and invades their personal lives (Chen et al., 2022). Techno-complexity is defined as a situation where technology makes students feel that their skill sets are inadequate (Ibrahim and Yusoff, 2015). Techno-insecurity is defined as the situation where the students feel threatened about poor academic performance compared to other students, who have a better knowledge of using technology (Chiu et al., 2023). Techno-uncertainty refers to a situation

where frequent changes and upgrades in technology create uncertainty for students (Sareen, 2019).

Consent

Informed consent was taken from the participants. Data confidentiality and privacy were assured by distributing anonymous questionnaires. The aim of the study was clarified to all study participants at the beginning of the questionnaire and the response was voluntary.

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 were coded, processed, and analyzed using Statistical Package for Social Sciences (SPSS) program (version 17) for windows. Quantitative data were presented using mean and standard deviation while qualitative data were presented using frequency and percentages. The degree of technostress creators was expressed as Mild, Moderate and Severe and their numbers and percentages were reported as in Abo Mokh et al. (2021) study. Technostress creators means and standard deviation were calculated as in the studies carried on by Booker et al. (2014), Tarafdar et al. (2014) and Sareen (2019). P-values of > 0.05 were considered statistically significant.

Results

Table 1: Sociodemographic characteristics of the studied participants (No = 814).

Characters	No	%
Gender		
Male	296	36.4
Female	518	63.6
Residence		
Urban	226	27.8
Rural	588	72.2
Years of experience using ICT		
< 5	407	50.0
5 to 10	287	35.3
>10	120	14.7
Hours spent on a technology device per day		
< 5	325	39.9
5 to 10	376	46.2
>10	113	13.9
Availability of good Wi-Fi in study places		
NO	245	30.1
Yes	569	69.9

ICT: Information and Communication Technologies

Table 1 showed that the study sample was mostly females (63.6 %) ,from rural areas (72.2 %), 46.2% spent from 5 to 10 hours on a technology device daily; and had less than 5 years of experience in computer work. Most of them (69.9%) had good Wi-Fi in their study places.

Table 2(a): Techno-overload, and techno-invasion among the studied participants.

Technostress creators		Mild No %	Moderate No %	Severe No %
Techno-overload	I am forced to increase my pace.	70 (8.6)	234 (28.7)	510 (62.7)
	I am forced to do more than I can handle.	252 (31.0)	257 (31.5)	305 (37.5)
	I am forced to work with very tight time schedules.	301 (37.0)	234 (28.7)	279 (34.3)
	I am forced to change my study to adapt to new technologies.	193 (23.7)	205 (25.2)	419 (51.1)
	I have a higher load because of technology complexity.	386 (47.4)	206 (25.3)	222 (27.3)
Techno-invasion	I spend less time with my family due to this technology.	246 (30.2)	139 (17.1)	429 (52.7)
	I have to be in touch with my study even during my vacation.	142 (17.4)	172 (21.1)	500 (61.4)
	I sacrifice my vacations to keep current on new technologies.	372 (45.7)	196 (24.1)	246 (30.2)
	I feel my personal life is being invaded by this technology.	171 (21.0)	171 (21.0)	472 (58.0)

Answers to different questions about each technostress creator were graded as Mild, Moderate, and Severe. Frequency and percentages of study participants who reported severe grades are shown in Table 2(a). Concerning techno-overload, more than half of the students were forced to work much faster and change their study to adapt to new technologies (62.7% and 51.1%) respectively. Regarding techno-invasion, 61.4% have to be in touch with work during vacation due to technology, 58% felt their personal life was being invaded and 52.7 % reported spending less time with family due to technology.

Table 2(b): Techno-complexity, techno-insecurity, and techno-uncertainty among the studied participants.

Technostress creators		Mild No %	Moderate No %	Severe No %
Techno-complexity	My knowledge about technology is not enough to handle study.	295 (36.2)	240 (29.5)	279 (34.3)
	I need a long time to understand and use new technologies.	327 (40.2)	199 (24.4)	288 (35.4)
	I do not find enough time to upgrade my technology skills.	291 (35.7)	234 (28.8)	289 (35.5)
	New students know more about computer technology than I do.	287 (35.3)	246 (30.2)	281 (34.5)
	I often find it too complex to understand new technologies.	333 (40.9)	221 (27.2)	260 (31.9)
Techno-insecurity	I feel constant threat due to new technologies.	411 (50.5)	193 (23.7)	210 (25.8)
	I have to constantly update my skills.	74 (9.1)	142 (17.4)	598 (73.5)
	I am threatened by colleagues with newer technology skills.	587 (72.1)	124 (15.2)	103 (12.7)
	I do not share knowledge with colleagues due to competition.	548 (67.3)	130 (16.0)	136 (16.7)
	Knowledge sharing is generally limited due to competition.	426 (52.3)	195 (24.0)	193 (23.7)
Techno-uncertainty	There are always new developments.	126 (15.5)	209 (25.7)	479 (58.8)
	There are constant changes in software.	147 (18.0)	270 (33.2)	397 (48.8)
	There are constant changes in hardware.	160 (19.7)	295 (36.2)	359 (44.1)
	There are frequent upgrades in computer networks.	157 (19.3)	269 (33.0)	388 (47.7)

In table 2(b), less than half of the students gave answers that indicate severe techno-complexity. In techno-insecurity, 73.5% reported they have to constantly update their skills. About 58% of the students reported new developments in the technologies used in the organization under the domain of techno-uncertainty.

Table 3: Technostress creators (Mean ±SD) according to different related factors (No = 814).

Factors	Techno-overload	Techno-invasion	Techno-complexity	Techno-insecurity	Techno-uncertainty
Overall	3.15 ± 0.59	3.29 ± 0.766	2.95 ± 0.73	2.74 ± 0.64	3.35 ± 0.78
Gender: Male	3.20 ± 0.60	3.31 ± 0.77	0.74 ± 2.88	0.67 ± 2.80	3.33 ± 0.80
Female	3.13 ± 0.59	3.28 ± 0.76	0.72 ± 3.00	0.62 ± 2.70	3.35 ± 0.77
P value	0.09	0.589	*0.03	*0.03	0.69
Residence: Rural	0.63 ± 3.14	0.74 ± 3.28	0.70 ± 3.00	0.61 ± 2.74	0.73 ± 3.40
Urban	0.57 ± 3.20	0.83 ± 3.33	0.77 ± 2.85	0.71 ± 2.75	0.89 ± 3.22
P value	0.16	0.42	*0.01	0.73	**0.00***
Quality of Wi fi:					
Poor	0.61 ± 3.14	0.78 ± 3.37	0.71 ± 3.13	0.58 ± 2.84	0.78 ± 3.19
Good	0.58 ± 3.16	0.76 ± 3.26	0.73 ± 2.88	0.66 ± 2.70	0.77 ± 3.41
P value	0.71	0.07	**0.00***	**0.00***	**0.00***
Years of ICT use: < 5	0.60 ± 3.14	0.76 ± 3.28	0.67 ± 3.12	0.64 ± 2.81	0.75 ± 3.39
5 to 10	0.58 ± 3.14	0.79 ± 3.23	0.72 ± 2.87	0.60 ± 2.68	0.77 ± 3.33
>10	0.60 ± 3.27	0.73 ± 3.47	0.79 ± 2.58	2.63 ± 0.69	0.89 ± 3.25
P value	0.09	**0.02***	**0.00***	**0.00***	0.20
Daily hours using ICT:					
< 5	3.08 ± 0.58	3.07 ± 0.80	3.02 ± 0.04	2.72 ± 0.63	3.43 ± 0.76
5 to 10	3.20 ± 0.58	3.42 ± 0.71	2.91 ± 0.04	2.75 ± 0.62	3.30 ± 0.77
>10	3.22 ± 0.64	3.49 ± 0.70	2.90 ± 0.08	2.77 ± 0.73	3.24 ± 0.85
P value	**0.02***	**0.00***	0.12	0.72	**0.03***

* **:**Significant values   ICT: Information and Communication Technologies

Chi square is the used test of significance for all variables in the table.

Table 3 showed that techno-overload means were statistically significantly higher among medical students who spent more than 10 hours per day on a technology device (3.22 ± 0.64). Techno-invasion is shown to be statistically significantly higher among students who have more than 10 years of ICT experience and spend more than 10 hours using technology per day (3.47 ± 0.73 and 3.49 ± 0.70) respectively. Concerning techno-complexity, it was statistically significantly higher among female students (3.00 ± 0.72), from rural areas (3.00 ± 0.70), having a poor-quality Wi-Fi connection (3.13 ± 0.71), and having less than 5 years of ICT experience (3.12 ± 0.67). Regarding techno-insecurity, results showed statistically significant higher results for male students (2.80 ± 0.67), with poor- quality Wi-Fi connections (2.84 ± 0.58), and less than 5 years of ICT experience (2.81 ± 0.64). Rural students, with good Wi-Fi connection, who spent less than 5 hours per day on technology devices showed statistically significant higher techno-uncertainty (3.40 ± 0.73, 3.41 ± 0.77, and 3.43 ± 0.76) respectively.

Discussion

Extensive use of technology in education compelled students to complete all the required tasks such as attending lectures, doing assignments, quizzes, and exams through online systems and challenged them to increase their information technology knowledge (Upadhyaya, 2021). The current study investigated the different technostress creators in relation to gender, residence, quality of available Wi-Fi connection, years of ICT experience, and the number of daily hours spent using technology (Table 1). Techno-overload was found to be significantly related to spending more than 10 hours daily using the technology. This is in accordance with Matthes et al. (2020) who reported that long hours of technology use are a source of information overload and stress. This could be explained that being available online all the time affects wellbeing (Ingusci et al., 2021).

The present work showed higher technostress creators among medical students. Techno-uncertainty was the highest and techno-insecurity was the lowest (Table 3). This was expected because of the extensive use of technology in education particularly

after COVID-19 and the restrictions encountered thereafter (Firmansyah et al., 2021). Nearly half of the students were spending five to ten hours per day on technology devices (Table 1). A similar study on school students reported a statistically significant increase in the time spent on devices from 6.2 to 19.8 weekly hours (Saxena et al., 2021).

In the present research, having to work faster and adapt to new technologies were the most reported domains in techno-overload (Table 2(a)). Moore (2000) in his study on an examination of work exhaustion in technology professionals in USA, documented that ICT users experienced more workload than expected and were pressured by the narrow time schedules. More than half of the students reported a severe degree of techno invasion (Table 2(a)). Khlaif et al (2023) reported that their study participants suffered distress because they have to perform duties at home with no limitation on work hours and had to cancel social activities.

Less than half of the studied students reported severe techno-complexity (Table 2(b)). This might be explained by student familiarity with technical issues from excess social media use. The necessity to update ICT

skills was the most reported creator of severe techno-insecurity among the studied group (Table 2(b)). This is similar to the work done by Asad et al. (2023) on post graduate students; they reported that techno-insecurity was mainly due to feeling of constant threat by the continuous new advances in technology.

Regarding techno-uncertainty, more than half of the students declared that the continuous developments in technology as a source of severe technostress (Table 2 b). In a similar study done by Kasemy et al. (2022), fear from losing information by clicking the wrong key was the most highlighted source of techno-uncertainty.

The studied students who are spending longer hours using a technology device had higher techno-invasion (Table 3), which is supported by Aleksić et al. (2024). On the other hand, this study revealed that techno-invasion was significantly associated with higher ICT experience (Table 2 a). Students with higher ICT experience are more engaged in technology use, spending long hours on technology devices, which ends in techno-invasion (Heidari et al., 2021).

In the present research, being a female increase the likelihood of feeling that their skills are inadequate more than being a male (techno-complexity) (Table 3). This may be due to physiological differences and variations in general interests between the genders. Marchiori et al. (2019) published that techno-complexity and techno-insecurity are more common among women while techno-overload and techno-invasion are more among men. Results of the current study showed that living in rural areas with poor Wi-Fi connection will hinder the ability to acquire more technology knowledge and support, thus increasing the perception of techno-insecurity (Table 3). Similarly, Talib et al. (2022) reported that females from rural places are more likely to suffer from techno-complexity and techno-overload.

There was a statistically significant association between techno-insecurity and being a male, having less than 5 years of ICT experience, and having poor Wi-Fi connection among the studied group (Table 3). This was in agreement with a study done by Sareen, 2019, who reported that techno-insecurity is more common among males than females and this was statistically significant. Another study reported that there is

no significant difference between males and females regarding techno-insecurity (Saka et al., 2020). Li and Wang (2021) documented that there is no statistically significant different between males and females in any technostress creator. Having short years of experience increases the threat of insufficiency in front of the increasing technological demands. The present study showed that having poor Wi-Fi connection will decrease the availability of ICT learning resources and the availability of Information Technology (IT) support (Table 3). All these factors contribute to techno-insecurity and technostress.

There was a significant association between techno-uncertainty and spending less than 5 hours per day using technology devices among the studied group (Table 3); this contrasts with Ma and Turel (2019) who reported that those who used technology for longer periods experienced greater techno-uncertainty. The present results can be explained by the fact that fewer daily hours of ICT use may contribute to less chance to learn and get experience which end in more techno-uncertainty.

Rural residence is significantly associated with techno-uncertainty among the studied students (Table 3), unlike the study conducted by Toraman and Aktan (2022), which documented that living in rural areas decrease access to continuous changes of technology which makes techno-uncertainty unlikely. Also, having a fair Wi-Fi connection is significantly associated with techno-uncertainty (Table 3). This is opposite to the findings of Harunavamwe and Ward, (2022) who found having poor internet connections and poor old devices increase the unreliability strain and the technostress resulting from techno-uncertainty.

Conclusion

Medical students suffer from techno-insecurity and techno-overload. Increasing the daily hours spent using technology devices increases technostress especially techno-overload and techno-invasion. Female students experience more techno-complexity, while male students suffer more from techno-insecurity. An inadequate Wi-Fi connection is linked to Techno-complexity and insecurity that in turn affects academic productivity.

Recommendations

Providing more IT support services for students may help them to

encounter the technostress associated with the increased use of technology in education.

Study limitations: The current study is a cross-section survey that gives an idea about the intensity of different creators of technostress but cannot give an idea about risk factors. Questionnaire is the tool of data collection and sometimes the respondents' answers may not be sufficiently accurate. Even though, it spotlighted an important and increasing problem among the students, especially the medical ones.

Conflict of interest

Authors declared that there is no conflict of interest.

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