POST-PANDEMIC TECHNOSTRESS IN UNIVERSITY PROFESSORS: CASE STUDY

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Abstract

The Covid 19 in Ecuador generated that in public and private companies there are labor changes such as teleworking and the use of Information Technologies (ICTs) with physical and mental consequences that require evaluation, higher education is not the exception. In this context, technostress due to prolonged use of a computer has brought consequences such as visual fatigue and psychosocial health conditions that must be studied. The objective is to determine the levels of technostress due to the use of a computer in institutions of Higher Education: National University of Chimborazo, Polytechnic School of Chimborazo and Private University of Loja. The technostress test proposed in the NTP 730 was applied, it was complemented with sociodemographic variables. The population consisted of 187 servants and university students. The result found of technostress: 65.8 % low, 25.1 % medium and 9.1 % high; the correlation is established by means of Cramer's V between the variables and the test applied with results that do not influence the phenomenon investigated. It is concluded the important presence of medium-high technostress in the analyzed sample that generates consequences to their health, so prevention measures must be implemented to avoid physical and mental diseases.

Keywords: Technostress, Higher Education, preventive measures

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Introduction

The World Health Organization (WHO, 2020), states that the COVID-19 pandemic, throughout the world has taken a high toll on its inhabitants with an impact on the quality of life of individuals, for this reason it seeks to know the incidence of psychosocial factors in the new "normal" (Ramírez-Ortiz et al., 2020), which has caused confinement and a different way of doing work known as teleworking to avoid contagion by the virus and generate another option to do the task.

At present society is at the forefront of digital culture with innumerable benefits due to constant technological innovation to facilitate the work processes of today and tomorrow: The use of Information and Communication Technologies (ICT) are very important in daily activity especially in teachers of educational institutions in this case study the higher, with many possibilities to apply in the teaching-learning process: teachers and students (cognitive part) and, on the other hand, it has generated negative effects due to the lack of management of technologies (personal) and valid origin of the information (Jiménez et al., 2017;Cabezas-Heredia et al., 2021).

The post-COVID-19 pandemic has led to an increase in technostress. Technostress is the discomfort experienced due to excessive use of technology and dependence on digital devices. During the pandemic, people have experienced increased anxiety, exhaustion, and difficulty disconnecting from screens.

In the post-COVID-19 pandemic, they have examined technostress and its implications for mental health. Research such as those conducted by Tarafdar, Tu and Ragu-Nathan (2007) and Salanova, Llorens and Cifre (2013) has explored the factors that contribute to technostress, including information overload, lack of control and interference of work in personal life.

Post-pandemic technostress implements self-management strategies and balance between the use of technology and time spent on offline activities. Setting clear limits for device use, practicing digital disconnection regularly, pursuing activities that foster well-being, and maintaining open communication about the impact of technology on mental health are key measures to counter technostress in the post-pandemic era.

Technostress is considered a psychological aspect with negative effects commensurate with the use of ICT. Currently, due to the presence of the coronavirus, people had to stay at home, so universities used ICT to do so, this generated a series of difficulties due to the use of

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technological devices in classes, for research and other activities inherent to teaching. (Salanova, 2003; Cabezas-Heredia et al., 2023).

In the fourth industrial revolution, technostress appears as a problem in all sectors due to the lack of health management or medical surveillance before the use of electronic devices, work and personal life. This has been called the tiredness society caused by a global connectivity at work, with a work overload and decreased social contact. This makes the work more objective, with a lack of man-work self-realization. (Orejuela, 2018;Duarte, 2021:Granda, 2022).

In order to define stress and technostress in occupational health and safety, the World Health Organization (WHO) presents an approach that mentions as a state of physical, mental and social well-being with conditions or diseases, where lies the importance of identifying psychosocial risk factors, stress and technostress as elements that generate discomfort and affect people's health.

Technostress is the psychological tension or discomfort experienced by a person as a result of interaction with technology, especially new information and communication technologies (ICT). This phenomenon is characterized by feeling overwhelmed, anxious, frustrated or exhausted due to over-reliance on technology, lack of skills to use it efficiently or the constant pressure to be connected and available 24 hours a day.

According to Salanova, M., & Llorens, S. (2016), "Technostress can be defined as a stress response that arises in an individual as a result of interaction with technology and the inability to manage it effectively." Overexposure by the use of a computer makes workers more likely to get sick from stress and technostress than from occupational diseases, the implementation of ICT, its continuous access, connectivity and permanent communication makes individuals make incorrect use and abuse of them. García de la Torre A, (2016).

The excessive use of technology generates negative impact on the mental health of people such as: stress and anxiety, among others. (Salanova, Llorens and Cifre, 2013). Being always connected and overexposure to digital information can increase levels of stress and depression. (Tarafdar, Tu, Ragu-Nathan and Ragu-Nathan, 2007;Mazon-Fierro, 2022), this causes difficulties in interpersonal relationships, decreases the ability to communicate and connect with the real world.

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Occupational technostress has its own risk factors: technodemands and absence of labor technoresources. The demands on workers who use ICT due to work overload, routine at work, boring and monotonous, do not require mental and sustained effort, role conflict and work-family conflict. The increase of information to perform the task that must be treated. The overload of information increases the workload and the difficulty in the treatment and interpretation of it. (NTP 730).

ICTs generate a total isolation and decrease in face-to-face communication skills, the impact on work performance: reducing productivity and concentration due to the constant interruption by notifications and the difficulty of disconnection from work, can increase the workload, generate role conflict, which affects efficiency and work performance, They can also cause physical symptoms such as: headaches, visual fatigue and sleep disorders, neck pain, shoulders, back due to bad postures.

Visual fatigue analyzed by Inca & Cabezas (2023) is another effect of technostress that, due to the effects of telestudy and excessive computer use, requires preventive measures to reduce the symptoms present through health surveillance. In a work environment there are three types of intervention:

Primary: before the risk appears, a prevention plan can be made in which the identification, evaluation and preventive measures of the risks that have been detected and have not been eliminated (Regulation of the Occupational Risk Prevention Services, 1997;Molina-Granja, 2022:Paucar-Leòn,2022) where the functions and responsibilities of the jobs must be clarified, establish clear channels of communication, bulletin boards, intranet and emails; train managers in social skills, assertiveness, leadership and negotiation; employee welcome programs; worker participation; training in occupational risk prevention, health surveillance; Rotation of posts.

Secondary prevention: when the risk has already appeared and measures should be implemented to reduce it as much as possible: report on the results of the evaluation; training on psychosocial risks and their consequences; incorporate problem-solving programs; modify risk situations; Incorporate groups to improve communication and redesign jobs.

Tertiary prevention: it is aimed at reducing the negative effects and consequences of risks once they have appeared, it is about rehabilitating the worker who has suffered the damage and avoiding relapses.

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This research is the product of a project entitled: Creation of a protocol for coping and prevention of post-pandemic technostress to mitigate psychosocial risks in higher education institutions, sees the need to know the reality of these institutions on psychosocial aspects so it arises the following research problem to be solved: **Determine the technostress levels of the staff of the post-pandemic higher education institutions involved in the project?**

Method

Research Design and Type

The research was non-experimental, the variables are not manipulated, due to the cross-sectional time, it was analyzed in a single instant, descriptive since it allowed to investigate the incidence of technostress in the university sector after the Covid 19 pandemic by the use of a computer, correlational since the relationship between the study variables was determined by means of Cramer's V and the sociodemographic variables, of field since he used the observation techniques in the universities immersed in the project and the surveys carried out.

Sample and Study Population

The study population was the members of the university estates: teachers, students, workers and employees of the National University of Chimborazo, Polytechnic School of Chimborazo, Private Technical University of Loja, there were 187 random respondents, so the entire population was used and no sampling was performed. ,

Methodology and/or instruments used

Those surveyed by the technostress test, participated voluntarily and anonymously, guaranteeing the confidentiality of the same. Those involved were sent a link containing the test created in the google forms, prior to which, they were given an induction of the process of filling it out.

The data collected on the computer through Google drive, was downloaded and programmed in Excel sheet, then this data was exported to SPSS V26, to be programmed. The technostress test consists of sociodemographic variables and those of the test that contains a licker scale validated in the NTP 730.

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The technostress test was analyzed through a data pilot test to determine reliability through Cronbach's Alpha and reliability through Kaiser-Meyer-Olkin (KMO). The technostress test consists of 16 items in the form of statements; These statements were evaluated with a scale with 6 response options from (0-6), which are: 0 = never; 1 = a couple of times a year; 2 = once a month; 3 = a couple of times a month; 4 = once a week; 5 = a couple of times a week; 6 = every day.

The test evaluates 4 dimensions, the same as shown in the following table:

Table No.1
Dimensions and assessment of technostress

Denomination	Items	Score
Technostress	Sum of P1 to P16	High: 65 to 96 Medium: 33 to 64 Low: 0 to 32
Dimensions		
Denomination	**Items**	**Score**
Skepticism	Sum of P1 to P4	High: From 17 to 24 Medium: 9 to 16 Low: 0 to 8
Fatigue	Sum of P5 to P8	High: From 17 to 24 Medium: 9 to 16 Low: 0 to 8
Anxiety	Sum of P9 to P12	High: From 17 to 24 Medium: 9 to 16 Low: 0 to 8
Inefficiency	Sum of P13 to P16	High: From 17 to 24 Medium: 9 to 16 Low: 0 to 8

Results and discussion

The following table presents the sociodemographic variables of the universities investigated:

Table No.2
Sociodemographic variables of the universities investigated

Gender	
Men	**Women**
64.2 %	35.8 %
Age	
From 18 to 28 years old	44.9 %
From 29 to 39 years old	23 %
From 40 to 50 years old	23.5 %
More than 51 years	8.5 %
Level of Education	
High school	15 %
Third Level	32.6 %
Fourth Level	52.4 %
Role	
Student	52.4 %
Employee/Worker	23.5 %
Teacher	24.1 %

Regarding the sociodemographic variables, it can be analyzed that of the respondents are mostly men with respect to gender; in 67.9% they are young people utilitarian of a computer that possibly has technostress; 52.4% have fourth level studies and in 52.4% of respondents are students compared to employees and teachers.

The following graph shows the sociodemographic variable referring to the origin of the respondents' university:

Graphic No. 1

Place of origin of the university servers surveyed
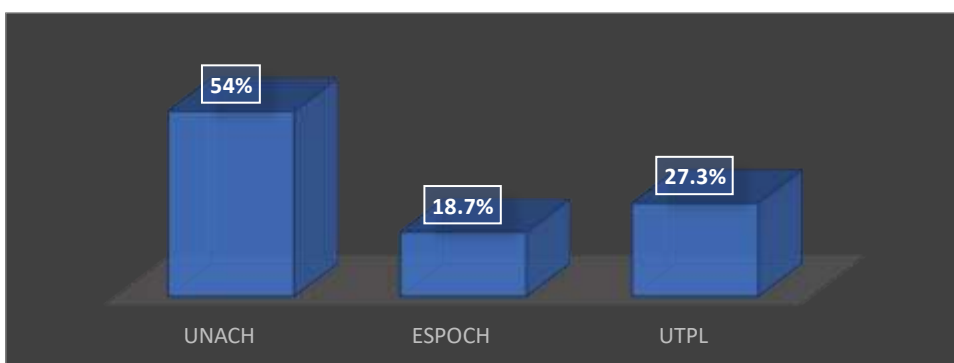
The respondents on technostress the results are as follows: 54% are from the UNACH, 18.7% from the ESPOCH and 27.3% from the UTPL the same ones that were randomly found through the link created in google forms.

Regarding the technostress detected, the results are presented in the graph and are as follows:

Graphic No. 2
Results of the Technostress of the people surveyed
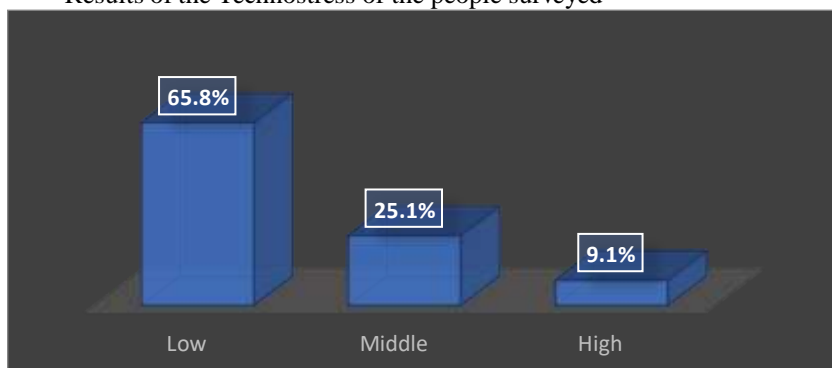
The technostress found in the respondents: 65.8% low, 25.1% medium and 9.1% high, it can be seen that there is an important medium-high % with technostress that has negative

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consequences for health in the mental aspect so you must perform health surveillance, positive psychology program to mitigate and referring to the cognitive part the university staff involved in the research must be trained.

The 4 dimensions of technostress were analyzed and are presented in the following graphs:
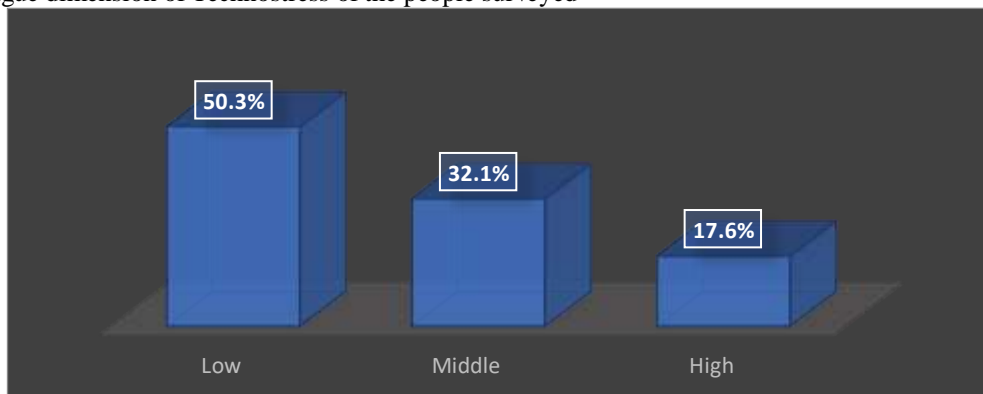
Graphic No. 3
Dimension Skepticism of the Technostress of the people surveyed
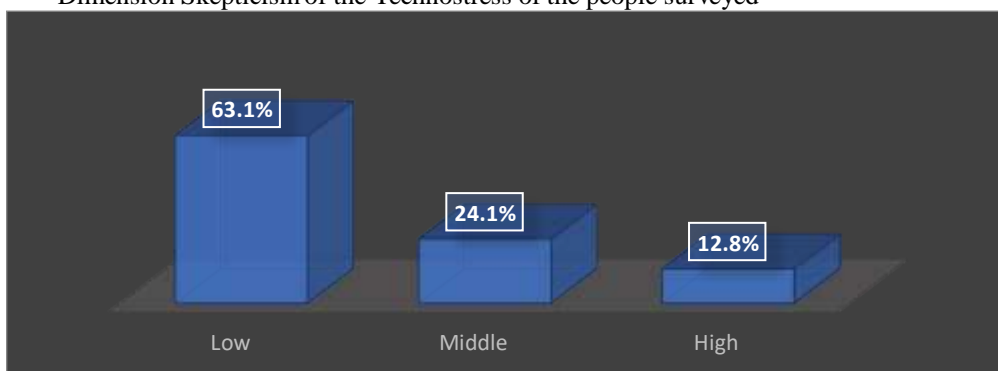
The skepticism dimension presents a: 63.1% low, 24.1% medium and 12.8% high, it is concluded that there is medium-high skepticism so it is recommended to train on the advantages of the use of ICTs, establish computer packages according to the task, should be complemented with an ergonomic study.
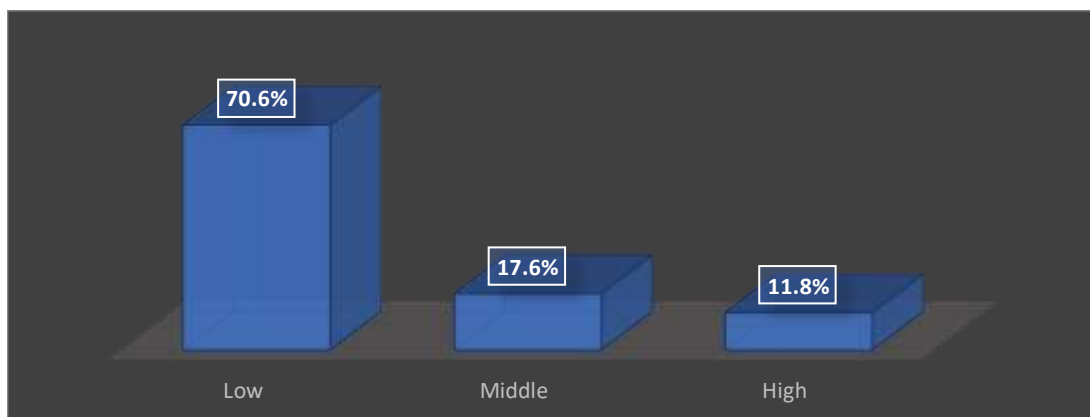
Graphic No. 4

Fatigue dimension of Technostress of the people surveyed

The fatigue dimension presents a 50.3% low, 31.1% medium and 17.6% high, it is concluded that there is medium high fatigue so it is recommended that to reduce the effect a study should be carried out on the workload and perform shift rotation, work organization to reduce fatigue, complement with visual exercises such as 20-20-20.

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Graphic No. 5
Anxiety dimension of Technostress of the people surveyed

The anxiety dimension presents a: 70.6% low, 17.6% medium and 11.8% high, it is concluded that there is medium high anxiety so it is recommended that to reduce the effect an analysis of the positive and negative aspects that cause the phenomenon of anxiety to stay in front of a computer and use the Tics with problems for the health of the user is recommended preventive measures and health surveillance.

Graphic No. 6

Inefficiency dimension of Technostress of the people surveyed
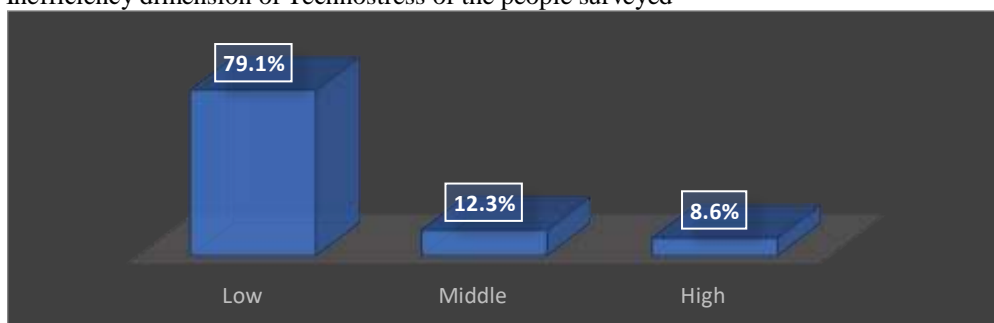
The inefficiency dimension presents a: 79.1 % low, 12.3 % medium and 8.6 % high, it is concluded that there is medium high inefficiency so it is recommended to reduce the effect should be trained on the advantages it has in speed, reliability of the results for decision-making of the functions entrusted in the task.

The following table presents the calculation of the reliability of the technostress test by means of Crombach's Alpha.

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Table No.3

Crombach's alpha of the Technostress test

Reliability statistics	
Cronbach's alpha	N of elements
0,927	16

The value of Crombach's Alpha is 0.927, which means that it is very good so the test is reliable.

The following table presents the calculation of the reliability of the technostress test by means of the KMO.

Table No. 4

KMO of the Technostress test

KMO and Bartlett Test	
Kaiser-Meyer-Olkin measurement of sampling adequacy	0,913

The KMO value is 0.913, which means that it is very good so the test is reliable. It is concluded that being reliable and reliable can be applied for this research environment.

The following table establishes the correlation between the variable Gender compared to Technostress and its dimensions by means of Cramer's V.

Table No. 5

Correlation between Gender and Technostress with its dimensions

Denomination	Cramer's V value and levels	Interpretation
Gender - Technostress	Cramer's V = 0.153 Male: 85 low, 27 medium and 8 high Female: 38 low, 20 medium and 9 high	The effect is small There is technostress in a medium-high frequency that needs to be analyzed
Gender - Skepticism	Cramer's V = 0.047 Male: 77 low, 29 medium and 14 high Female: 41 low, 16 medium and 10 high	The effect is negligible There is skepticism in a medium-high frequency that needs to be analyzed
Gender - Fatigue	Cramer's V = 0.210 Male: 65 low, 41 medium and 14 high Female: 29 low, 19 medium and 19 high	The effect is small There is fatigue in a medium-high frequency that needs to be analyzed
Gender - Anxiety	Cramer's V = 0.217 Male: 100 low, 12 medium and 8 high Female: 48 low, 11 medium and 8 high	The effect is small There is anxiety in a medium high frequency that needs to be analyzed
Gender - Inefficiency	Cramer's V = 0.138 Male: 100 low, 12 medium and 8 high Female: 48 low, 11 medium and 8 high	The effect is small There is inefficiency in a medium-high frequency that needs to be analyzed

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With regard to technostress, it occurs mostly in male teachers, this finding by Ruiz et al. (2018) states that this could be due to the situation of isolation and teleworking at home that implies an excessive use of technologies. The dimensions of technostress present low correlations with gender, a study by Villanueva and Parra (2012) that found no significant differences between men and women, suggesting the exploration of the dimensions that make up the instrument. technostress in women (Dias and Costa, 2008), suggest an inequality in the division of labor by organizations, which would favor women.

Table No. 6
Correlation between Age and Technostress with their dimensions

Denomination	Cramer's V value and levels	Interpretation
Age - Technostress	Cramer's V = 0.128 From 18 to 28 years old: 51 low, 23 medium and 10 high From 29 to 39 years old: 31 low, 11 medium and 1 high From 40 to 50 years old: 31 low, 10 medium and 3 high Over 51 years: 10 low, 3 medium and 3 high	The effect is small There is technostress in a medium-high frequency that needs to be analyzed
Age - Skepticism	Cramer's V = 0.105 From 18 to 28 years old: 57 low, 17 medium and 10 high From 29 to 39 years old: 27 low, 12 medium and 4 high From 40 to 50 years: 61 low, 12 medium and 6 high Over 51 years: 8 low, 4 medium and 4 high	The effect is small There is skepticism in a medium-high frequency that needs to be analyzed
Age - Fatigue	Cramer's V = 0.136 From 18 to 28 years old: 41 low, 29 medium and 14 high From 29 to 39 years old: 91 low, 17 medium and 7 high From 40 to 50 years old: 22 low, 13 medium and 9 high Over 51 years: 12 low, 1 medium and 3 high	The effect is small There is fatigue in a medium-high frequency that needs to be analyzed
Age - Anxiety	Cramer's V = 0.165 From 18 to 28 years old: 51 low, 21 medium and 12 high From 29 to 39 years old: 36 low, 4 medium and 3 high	The effect is small There is anxiety in a medium high frequency that needs to be analyzed

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	From 40 to 50 years old: 33 low, 7 medium and 4 high Over 51 years: 12 low, 1 medium and 3 high	
Age - Inefficiency	Cramer's V = 0.160 From 18 to 28 years old: 59 low, 14 medium and 11 high From 29 to 39 years old: 38 low, 4 medium and 1 high From 40 to 50 years old: 39 low, 3 medium and 2 high Over 51 years: 12 low, 2 medium and 2 high	The effect is small There is inefficiency in a medium-high frequency that needs to be analyzed

A study conducted on technostress and age results in and defends the idea that older public workers are more prone to technology-related stress at work (Gómez et al, 2020), despite this, more research should be done to support these findings, which regarding this study over the years there are high cases of technostress, The correlation is low between age, technostress and dimensions is low this may be due to other stressors.

A research carried out in Spain identified that age increases the levels of fatigue, anxiety, skepticism and more consistent beliefs of ineffectiveness in the use of ICT. (Salanova, 2007). Another study in Turkey (Özgür,2020) determined that age is important, the teacher's level of knowledge for the integration of technology in teaching and the technical support they receive predict technostress levels.

Table No. 7
Correlation between Level of Studies and Technostress with its dimensions

Denomination	Cramer's V value and levels	Interpretation
Level of Studies - Technostress	Cramer's V = 0.094 Secondary: 19 low, 5 medium and 4 high Third Level: 37 low, 17 medium and 7 high Fourth Level: 67 low, 25 medium and 6 high	The effect is negligible There is technostress in a medium-high frequency that needs to be analyzed
Level of Studies - Skepticism	Cramer's V = 0.131 Secondary: 23 low, 2 medium and 3 high Third Level: 37 low, 15 medium and 9 high Fourth Level: 58 low, 28 medium and 12 high	The effect is small There is skepticism in a medium-high frequency that needs to be analyzed

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Level of Education - Fatigue	Cramer's V = 0.086 Secondary: 16 low, 10 medium and 2 high Third Level: 29 low, 19 medium and 13 high Fourth Level: 98 low, 31 medium and 18 high	The effect is negligible There is fatigue in a medium-high frequency that needs to be analyzed
Level of Studies - Anxiety	Cramer's V = 0.131 Secondary: 21 low, 5 medium and 2 high Third Level: 36 low, 14 medium and 11 high Fourth Level: 75 low, 14 medium and 9 high	The effect is small There is anxiety in a medium high frequency that needs to be analyzed
Level of Studies - Inefficiency	Cramer's V = 0.152 Secondary:19 low, 6 medium and 3 high Third Level: 45 low, 7 medium and 9 high Fourth Level: 84 low, 10 medium and 4 high	The effect is small There is inefficiency in a medium-high frequency that needs to be analyzed

Studies in Palestine (Abo et al, 2021) examined the effect of online learning and technostress on teachers during the pandemic with a moderate level, so it was necessary to improve teachers' competencies in the use of technology. In the same way, findings found in Peru (Cari, 2020), analyzes the prevalence of technostress in primary education teachers and came to the conclusion of high and moderate levels. The levels of studies found in the research are low with medium-high cases that should be prevented.

Table No. 8

Correlation between the university where he/she works and Technostress with its dimensions

Denomination	Cramer's V value and levels.	Interpretation
University where you work - Tecnoestrés	Cramer's V = 0.124 UNACH: 62 low, 26 medium, and 13 high. ESPOCH: 27 low, 6 medium and 2 high UTPL: 34 low, 15 medium and 2 high	The effect is small Technostress exists at a high average frequency that requires analysis.

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University where you work - Skepticism	Cramer's V = 0.076 UNACH: 65 low, 21 medium and 15 high ESPOCH: 23 low, 9 medium and 3 alto UTPL: 30 low, 15 medium and 6 high	The effect is negligible There is skepticism at a high mean frequency that requires analysis
University where you work - Fatigue	Cramer's V = 0.118 UNACH: 45 low, 35 medium and 21 high ESPOCH: 23 low, 9 medium and 3 high UTPL: 26 low, 16 medium and 9 high	The effect is small Fatigue exists at a high average frequency that requires analysis
University where you work - Anxiety	Cramer's V = 0.100 UNACH: 67 low, 18 medium and 16 high ESPOCH: 27 low, 6 medium and 2 high UTPL: 38 low, 9 medium and 4 high	The effect is small There is anxiety at a high average frequency that needs to be analyzed
University where you work - Inefficiency	Cramer's V = 0.154 UNACH: 75 low, 12 medium and 14 high ESPOCH: 29 low, 4 medium and 2 high UTPL: 44 low, 7 medium	The effect is small There is inefficiency at a high mean frequency that requires analysis

Regarding the sociodemographic variable University where he works and techno-stress, there are a greater number of medium-high cases at UNACH than in the other two analysed, Cramer's V is low, so there is no incidence of techno-stress and its dimensions, this is Due to the fact that computer users spend long hours in front of a PVD, it is recommended to reduce its use

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to avoid visual fatigue and other harmful effects on health, since techno-stress is a phenomenon that is intensifying more and more due to the consequences in different areas of life and due to the increase in cases of the COVID-19 pandemic that has forced a greater use of ICTs.

Table No. 9

Correlation between Job Type and Technostress with its dimensions

Denomination	Cramer's V value and levels	Interpretation
Job Type - Technostress	Cramer's V = 0.097 Student: 61 low, 25 medium and 12 high Employer/Worker: 32 low, 9 medium and 3 high Teacher: 30 low, 13 medium and 2 high	the effect is negligible There is technostress in a medium high frequency that requires to be analyzed
Type of Job - Skepticism	Cramer's V = 0.068 Student: 64 low, 20 medium and 14 high Employer/Worker: 26 low, 13 medium and 5 high Teacher: 28 low, 12 medium and 5 high	the effect is negligible There is skepticism in a high medium frequency that requires to be analyzed
Job Type - Fatigue	Cramer's V = 0.077 Student: 49 low, 30 medium and 19 high Employer/Worker: 24 low, 12 medium and 8 high Teacher: 21 low, 18 medium and 6 high	the effect is negligible There is fatigue in a medium high frequency that requires to be analyzed
Job Type - Anxiety	Cramer's V = 0.115 Student: 63 low, 20 medium and 15 high Employer/Worker: 35 low,	the effect is small There is anxiety in a medium high frequency that requires to be analyzed

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	5 medium and 4 high Teacher: 34 low, 8 medium and 3 high	
Type of Job - Inefficiency	Cramer's V = 0.122 Student: 73 low, 14 medium and 11 high Employer/Worker: 34 low, 6 medium and 4 high Teacher: 41 low, 3 medium and 1 high	the effect is small There is inefficiency in a high medium frequency that requires to be analyzed

The type of role played in the university on the use of technology and its frequency is important, its correlation is low, however the number of hours contributes to the presence of techno-stress with what is manifested in the research that techno-stress is a studied phenomenon to determine its causes and negative effects (Özgür ,2020) more frequently during the pandemic due to the use of ICT and whose symptoms: anxiety, physical illnesses, behavioral tension, technophobia, mental fatigue, memory disturbances, lack of concentration, irritability and feelings of exhaustion and insomnia (Molino et al, 2020) Therefore, it is necessary to design preventive measures to detect cases of techno-stress and provide timely care to reduce the symptoms and sequelae that they may cause.

Conclusions

Stress and techno-stress are present in workplaces, stress causes the body to activate and take action and solve the problem, when techno-stress is prolonged over time it is harmful to the safety and health of people, influences work activity, so risk management must be carried out with interest and concern for psychosocial risks.

The causes of stress and techno-stress are multiple, the preventive measures to be adopted must be comprehensive, for this we must take into account all the stressful factors and

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identify them in the organization. Psychosocial factors such as: work stress, burnout, workplace bullying among others make it necessary to identify them, measure them using existing, valid questionnaires and that not all can be applied to all situations.

Applied psychosociology is influenced by other elements, variables and personal and particular characteristics of the individual that can be stressful. Personal characteristics influence the perception and the way of coping with stress and techno-stress, so the perception of the risk that the worker has and that are derived from the organization itself, interaction between colleagues, role conflict, etc. must be modified. etc

The obligation to prevent psychosocial risks that affect the worker outside the organization, have an impact on the company and must be intervened by the employer, a psychological intervention plan must be drawn up: The generating factors do not affect all people equally, These can appear in your personal or family environment, so it is very difficult to detect them, so the company must make available various types of resources such as: stress reduction techniques or techno-stress.

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