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STRESSTING PROPOSAL APPLICATION FOR STRESS DIAGNOSIS

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Abstract: In the last three years, stress has intensified due to COVID-19, so it is relevant to seek strategies to identify and cope with it, since it affects the daily life of any person in their emotional, physical, and psychological aspects, particularly among young people aged 18 to 25 years. The objective of this work is to make a proposal of the mobile application Stressting as a strategy, because mobile devices have high local penetration and acceptance among young people, to identify stress levels and prevent crisis situations. The design of Stressting was made with UML, after applying a survey with a stress diagnosis section by means of the Perceived Stress Scale with 10 items to determine the level of stress in university students through a quantitative, descriptive, and correlational study in a sample of 34 students, and unlike other applications it considers a diagnosis and a contact list for personalized attention. The scale was chosen because it has good internal consistency and is one of the most widely used and known internationally. The survey allowed us to know the stress level of the students and to corroborate the interest student in the application. The application is designed to diagnose stress and provide recommendations at the same time. The survey data was processed with Excel and shows that 58.82% of the students present moderate stress and 14.7% high stress, and that males present more stress than females. The scale has a good internal consistency with Alpha Crobach coefficient of 0.816. Stressting will be available free of charge and will allow the generation of general reports that can strengthen their integral formation with the follow-up of institutional tutoring. However, it is important that the institution implements workshops for coping with stress and the development of life skills.
Keywords: Stress diagnosis, academic stress, coping, mobile application, COVID-19.

INTRODUCTION

According to the BBC News (2023), the World Health Organization declared the end of the global health emergency for covid-19 on May 5, after just over 3 years. However, it indicated that while the emergency phase is over, the pandemic has not come to an end. In this regard, it is important to consider that COVID-19 pandemic caused significant stress, an individual adaptation response to internal or external threats (LECIC-TOSEVSKI et. al, 2011), partly due to social isolation and confinement, lost employes and the difficulty to adapt at new virtual work or study environment (BRISCESE et. al, 2020), (WEEMS et. al, 2020), (HAN et al, 2020), (SILAS; VÁZQUEZ, 2020). For example, in (TAYLOR et. al, 2020) it was said that in China more than 25% of its population experienced moderate to severe levels of stress or anxiety related as symptoms in response to COVID-19 based on emerging findings in (QUIE et al, 2020), (WANG et. al, 2020). In (MAZZA et. al, 2020) it was reported that 27.2% Italians experienced high to extremely high stress levels during the pandemic. Similarly, in (GONZÁLEZ RAMÍREZ et. al, 2020) it was revealed the presence of psychological distress and post-traumatic stress symptoms in over 25% of the population in México. Additionally, Silas and Vázquez (2020) conducted research with teachers (Mexico, Venezuela, Peru, Argentina, Bolivia, Paraguay, Colombia, Ecuador, Chile, Costa Rica, Panama, and Uruguay) in which it reported that 85% of those surveyed had five days approximately to migrate their courses to the online modality and given the inexperience and uncertainty about the correct ways to proceed, the teachers became saturated and overloaded the students with work, this caused a situation of stress and anxiety, among others.

Given the role that stress played in shaping behavioral responses to viral outbreaks and

its facilitation of the spread of infection, some researchers conducted studies to understand the nature and degree of adverse psychological response to the COVID-19 crisis, to understand the distress associated with COVID-19 and for identifying people in need help, or to identify students or/and professors with stress during online classes due to the COVID-19, causes and strategies for coping, among others. These studies were approached from different approaches due to the profile of the researchers, some of them were conducted by medical or psychological researchers, and others by educational researchers. In Liu et. al (2021) it was made an online study of a representative sample of Canadian adults where it was explored whether perceptions of threat from COVID-19 and efficacy to follow recommendations for preventing COVID-19 would mediate the relationships between personality traits (neuroticism, conscientiousness, extroversion, openness, and agreeableness) and perceived stress, the result of a person appraisal of a stressor as threatening or non-threatening, as well as one own ability to cope. Herein, it perceived threat and efficacy significantly mediated the relationship between neuroticism (e.g., tendency to be emotionally unstable, and experience such feelings as anxiety, worry, and fear) and stress, i.e., people with higher neuroticism experienced higher levels of stress due to higher levels of perceived threat and lower levels of efficacy, however, perceived threat it does not mediate the relationship between extroverts (e.g., tendency to be sociable, assertive, positive and with a high activity level) and stress.

In the same sense, Taylor et. al (2020) developed the 36-item COVID Stress Scales (CSS) to measure features (e.g., fear of becoming infected, fear of meeting possible contaminated objects or surfaces, fear of the socio-economic consequences of the pandemic, etc.) suggested by research and clinical observations of many people who exhibited stress or anxiety during the pandemic, as they pertain to COVID-19. Herein, it was identified five factors: 1) danger and contamination fears, 2) fears about economic consequences, 3) xenophobia, 4) compulsive checking and reassurance seeking, and 5) traumatic stress symptoms about COVID-19, that provided evidence of a COVID Stress Syndrome and the possibility to identify people in need of mental health services.

On the other hand, authors such as Pascoe, Hetrick and Parker (2020), and González (2020) reported that abrupt migration to online education generated difficulty sleeping, maladaptive stress, depression, among others, and this resulted in low academic performance, decreased motivation for learning and increased risk of dropping out of school. In (SANTANA CAMPAS et. al, 2022) found that 67.9% of students reported medium to high levels of stress using the Perceived Stress Scale-10 from Campo-Arias, Oviedo, and Herazo (2014), where females presented higher levels of stress than males, and more stress response strategies than males. Also, in (VASQUEZ SÁNCHEZ, MARTÍNEZ MARTÍNEZ, & SUÁREZ TORRES, 2021) it was found a moderate level stress in nursing students and it was indicated that "the prevailing stressors in college students were the limited time to work, the explanation of a topic in front of the class, the overload of assignments and academic work, and the different kinds of assignments requested by the professors, and in terms of the symptoms, the students presented drowsiness, trouble concentrating, itching, fingernail biting, and a feeling of depression and sadness"; through adaptation of the Systemic Cognitive Inventory Second Version (SISCO-SV) to the context of the crisis by COVID-19.

In general, stress, difficulty sleeping, and others similar situation are risk factors to health and life project for any person. Thus, stress diagnosis and understanding ways to manage it is critical in these days. Therefore, the objective of this work is to proposal a way for stress diagnosis (academic stress in special) through the application Stressting based on the 10-item Perceived Stress Scale (PSS). To achieve this, the PSS-10 was first applied through a Google form with a pilot group of university students, through which the internal consistency of the instrument was verified, and information was recovered (retrieved) to ensure the feasibility of using the application. The result of PSS was divided into three response intervals (low, medium, and high) to analyze statistics information. In addition, these intervals are used in Stressting to provide recommendations to help mitigate stress through suggested strategies (exercises, meditations, videos, web sites, writings, etc.) and information from clinics or support staff that can provide personalized attention.

The following section presents the methodology followed to carry out the proposal. Then results of the survey applied are presented, and finally, conclusions are given considering future work.

METHOD AND MATERIALS

First, an exploratory research was carried out to find out about similar works and proposals for stress measurement scales. Then, consulting experts and relevant literature, the choice of the scale was made according to its simplicity, ease, reported application and recommendations for use. Subsequetly, the scale was applied to a pilot gruop of students to verify its consistency, to know their stress coping strategies and their interest in using it to desing the application. The study was conducted under a quantitative approach with a descriptive and correlational design. Afterwards, a professional expert proposed strategies (videos, physical exercises, meditations, etc.) for each level of stress obtained from the PPS. Finally, after comparing some similar applications, Stressting was designed using to the UML method. Stressting is in the process of development using the scrum methodology.

INSTRUMENTS

The following scales were identified:

- The adaptation of OIT-OMS works stress scale composed of 25 items and distributed in seven dimensions (GALVÁN CORRAL et. al, 2019).
- Systemic Cognitive Inventory Second Version (SISCO) with 31-items (SILVA-RAMOS; LÓPEZ-COCOTLE & MEZA-ZAMORA, 2020), and the adaptation of the Systemic Cognitive Inventory Second Version (SISCO-SV) to COVID-19 with 47 items and three dimensions.
- Perceived Stress Scale with 14 items (PSS-14), Perceived Stress Scale with 10 items (PSS-10) and Perceived Stress Scale with 4 items (4). All of them with a single dimension (CAMPOS-ARIAS;OVIEDO, HERAZO, 2014).

PSS-10 was selected. This scale identifies the perception of psycological stressors and daily life stressors during the last month. It is composed of 10 items with five response options: never, almost never, occasionally, many times, and always, which are scored from 0 to 4, and the maximum score is 40. Items 4,5,7 and 8 are scored inversely. It does not have a specific cut-off point; the authors report that the higher the score, the higher the perceived stress. Following the strategy of Santana Campos (2022), scales were created to identify three levels of stress: low (0 to 17 points), medium (18 to 24 points) and high

(25 to 40 points). Additionally, two questions were asked to learn about the strategies they applied, to find out theirs interest in having a stress diagnosis application, and to identify some of their characteristics such as gender, semester, etc.

PILOT SAMPLE

A convenience sampling was applied with 34 university students from different educational programs of second semester or higher semesters. The criterion was interest and willingness to participate voluntarily in the study where 20% were woman and 14% were men.

The data were processed in Excel using descriptive statistics through frequencies, percentages, averages and Pearson correlation of variables, as well as obtaining the Crobach Alpha coefficient of 0.816, which is considered good for data consistency.

SIMILAR SOLUTIONS

Some applications or sites that have been implemented to counteract stress problems and their consequences (e.g., suicide) are as follows:

- CALMA (DARAY, OLIVERA FEDI & RODANTE, 2018). It is an aplication that was made to prevent suicide in Argentina and was developed for download on Google Play (Android) and App Store (Apple-iOS) for free throughout its territory. It works under two modalities, one "Out of crisis" (it has four functions: moments, agenda, profile and tips) and another "I need help" (it has four modules: mindfulness, interpersonal effectiveness, emotional regulation and radical acceptance).
- Serenit. This is an application in Google Play (Android). Application with cost, free for 72 hours and extends to a maximum of one week, but it has to register a payment form. It has a section for meditations and a diary. In meditations there are five levels, recommendations for sleep and recommendations to relieve stress, among others. In the daily part there are four sections: mini-meditations, daily practice, daily sleep and extends. The tool is self-managed, does not perform any prior diagnosis and does not have information for personalized attention. This information was taken directly from the application.
- Meditopia. This is an application in Google Paly. Application with cost, free for 72 hours and extends to a maximum of one week, but a form of payment must be registered. The tool is self-managed, does not perform prior diagnosis and does not have information for personalized attention. This information was taken directly from the application.
- OVAPU (CASTRO SÁNCHEZ & SÁNCHEZ ACOSTA, 2021). It is a website that was developed to know the traceability of the psychosocial support of engineering students at the University of Córdova.
- NAMELESS (CANDELARIO BERMELLO, 2022). It is website oriented to the study and care of the mental health of high school students of the Unidad Educativa Sagrada Familia de Nazareth Educational in the city of Guayaquil, Ecuador. This was developed to solve the problems of the Educational Unit, which cause stress, fatigue, bruxism, despair, etc.

APPLICATION DESIGN

A global analysis was carried out to

determine how the application (app, system) should work and from there its requirements emerged, which are divided into functional and non-functional.

a. Functional system requeriments

These are services that system present to users in order to correct execution, they are collected from survey, observation, between others methods, and they are described in the Table 1.

b. Non-functional requeriments

These are the properties that a system has for its correct functioning when it is executed, covering availability, security, flexibility, performance and other aspects that a system must have for its correct operation.

Subsequently, the roles (user: student or teacher who uses the app, and administrador: in charge of managing the users) of the application were defined to develop the use case diagrams, sequence diagrams and activity diagrams that were used as the basis for the implementation of Stressting. As an example, the things a user can do are representated in the use case diagram shown in Figure 1.

An example of activity diagram is shown in Figure 2, this corresponde to an system administrator that can create or modify users.

Figure 3 shown a sequence diagram to visualize results of stress levels.

RESULTS AND DISCUSSION

The study was conducted during the final stages (2022) of the pandemic in Jalisco, México, when the CUCEA and CUSUR institution returned to fase-to-face classes. Howerver, the information provided by students was from 2021. 34 students who participated in the study belonged to seven educational programs (EP): Information Technology (IT), Financial and Systems Administration (FSA), Business Engineering (BE), Public Accounting (PA), Psychology (PSICO), Human Resources (HR) and International Business (IB). The survey (PSS-10) was applied through a Google form shared in a Google Drive folder. Some statisticals data from this sample are: variance=58.19, standard deviation=7.63, and variance coeficiente= 0.3936 (39.36%).

The distribution by EP (35.29% IT, 5.88% PA, 2.94% HR, 11.76% FSA and 2.94% PSICO) can be seen in Figure 1, the result shows students mostly presented a medium stress level followed by low level. In addition, there is a correlation (Pearson) between stress and EP of 0.356, but it is weak. It should be noted that the highest percentage is for IT because they had the highest percentage of participants per Educational Program.

Figure 2 shows that the level of stress presented by the students is mostly moderate (58.82%), followed by a low level (26.47%) and a high level with 14.7% with a mean equal to 19.38. This implies that 73.52% (high and medium stress levels) of university students reported considerable levels of stress. These results coincide with those reported by Briscese et al. (2020), Han et al. (2020) and Weems et al. (2020), and confirm that if university education itself generates stress, stress levels increased in the virtual modality due to the abrupt changes and lack of preparation of both teachers and students in the use of tools and platforms for online classes.

The results of the perceived stress level with respect to the sex of the students can be seen in Table 3. Although there is no correlation (Pearson) between sex and stress level since the correlation coefficient is 0.0356, so stress is present in either sex. This has the same meaning as reported by Silva-Ramos, López-Cocotle, & Meza-Zamora (2020).

Likewise, the data in the Table 3 above indicate that males reported higher levels of stress than females, although a higher percentage of females reported more stress at the high level than s (60%). This is cosistent with reports by Piergiovanni and Depaula

Code	Requeriment	Description
RF-01	Have a login system	Users need permission to access app
RF-02	Validation of users	Administrator ensures that user information is available
RF-03	Registrate users: create, save, modify or eliminate information	Users can create an account, save, modify or delete their information. The administrator facilities them.
RF-04	Have a DataBase of users	Administrator creates and secures space to store all user information
RF-05	Generate and save diagnosis reports	For each user view points the stress diagnosis points
RF-06	Show recommendations according to stress level	Administrator and expert
RF-07	Give stress information	Administrator and expert

Tabla 1. Functional system requeriments.

Code	Requeriment	Description
RF-01	Access security	A user name and password must be provided
RF-02	Visualization and operation	Ensures access from an Android device
RF-03	Intuitive system and online help	Any inexperienced user should know how to operate all the functions of the application
RF-04	Show queries	User must be able to view queries quickly
RF-05	Online and offline access	User must be able to consult without Internet and only update with a connection
RF-06	Availability of access to the app	Application must be available 99.99% of the times the user tries to access it

Tabla 2. Non-functional system requeriments.

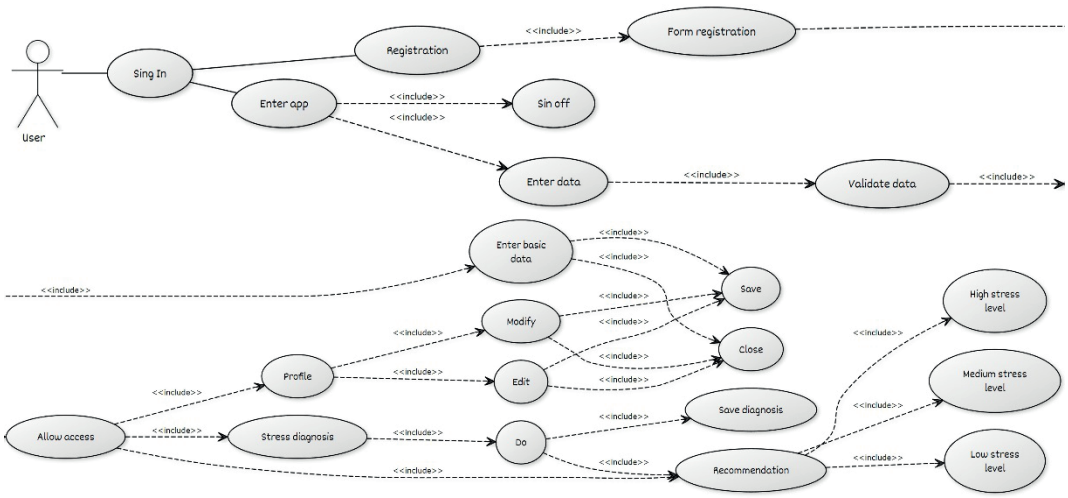

Figure 1. User use case diagram. Own source.

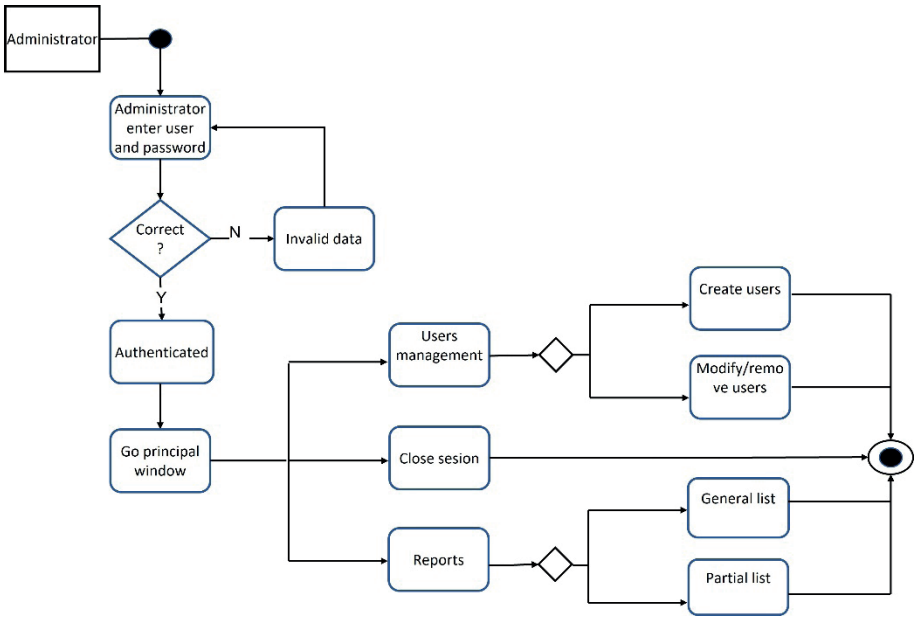

Figure 2. Administrator activity diagram. Own source.

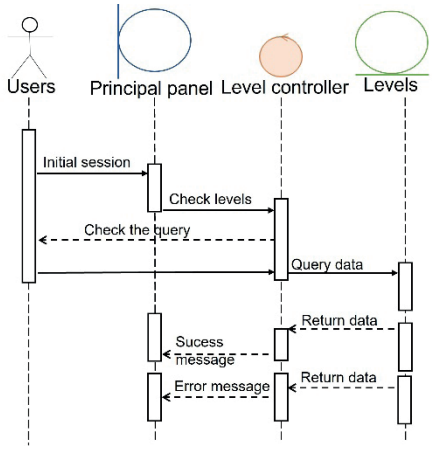

Figure 3. Stress levels visualization sequence diagram. Owen source.

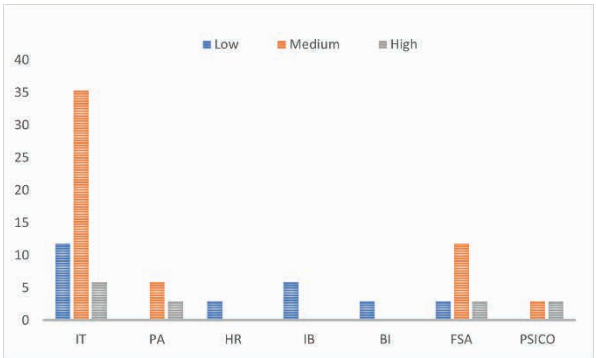

Figure 4. Stress level by EP. Own source.

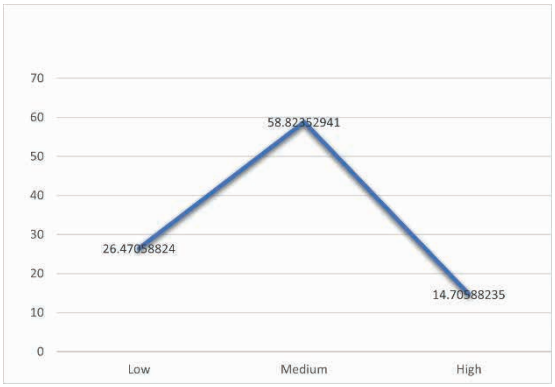

Figure 5. Perceived level stress. Own source.

Stress level	Female		Male	
	n	%	n	%
Low	4	44.45	5	55.55
Medium	7	35	13	65
High	3	60	2	40

Tabla 3. Perceived stress levels by sex, with female n=14 y with male n= 20.

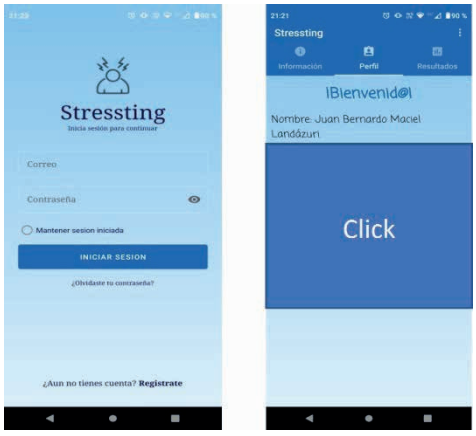

Figure 6. Example of Stressing sections. Own source.

(2018) and Dominguez-Lara and Fernández-Arata (2019), who state that males have higher self-efficacy in the face of stress.

The ages that were mostly identified are between 19 and 22 years old, this coincides somewht with that reported by Guadarama et. al (2012) which indicates that the highest frequency of stress ranges between 18 and 25 years.

As is mentioned in (SANTANA CAMPOS et. al, 2022) "Undoubtedly, the migration from face-to-face to virtual classes implied diverse stressful situations, however, it is clear that the teacher plays a fundamental role both in stress triggers and in the promotion of protective behaviors", this is also agreed upon, since some students mentioned that one of the stress triggers were the excessive workload, the hours in front of the computer, the lack of preparation of teachers in virtual classes and in some cases, they also mentioned the absence of the teacher and the lack of feedback on their assignments and work to know their academic progress.

Respect Stressting application, it is partially implemented because the recommendations for each level of the diagnosis have not yet been completed, it has been used locally by some students to give feedback, it is made in Java so that it can be accessed by Android devices. Examples of the login and profile interfaces can be seen in Figure 6.

CONCLUSIONS

The results of the present study determined the existence of a high stress index (73.52%) in higher education students with 58.82% at medium level and 14.7% at high level. Likewise, the existence of moderate academic stress predominantly in the male population, and the insignificat relationship between student stress and the educational program in which they are enrolled.

On the other hand, as some authors point out, attention should be paid to these results because the student who presents high levels of stress for a prolonged period can be affected in their academic performance and cause an imbalance in their life, and in some cases addiction problems or even suicide. Therefore, it is important to take measures against these levels of stress in students to help them improve their university education and to avoid repercussions in graduates and in the professional practice of all disciplines.

The Stressting application proposed here is a strategy for coping with stress. Students and teachers, among others, can use it free of charge to find out their stress level and, according to the results obtained, may have options or recommendations to avoid and prevent higher levels of stress or, if necessary, suggest immediate referral to specialized personnel.

In addition, it is important to promote among students the responsibility and organization of school work in order to minimize the intensity, frequency and reactions produced by stress. Likewise, it is important to promote healthy tutoring strategies that encourage dialogue and coexistence so that students can develop.

As future work, it is necessary to conclude the development of the application so that access tests are performed with multiple users, a database with sufficient space for access by the entire community of the institution is guaranteed, and Stressting can be integrated into Google Play so that students can perform their own diagnosis easily and quickly to prevent the risk of high stress that can lead to poor coping practices.

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