Exploring the Role of Job Satisfaction and Work-Life Balance: A Study on the Mental Health Among Software Engineers

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ABSTRACT

Depression, anxiety and stress behaviors increasingly affect more people in different work contexts. These behaviors have significant impacts on personal and professional life, affecting quality of life and work performance. This research project aims to investigate the relationship between job satisfaction and the occurrence of symptoms of anxiety, depression and stress, in software engineering, and explore the organizational management of these activities in relation to employee well-being. The research used a mixed-method approach, combining qualitative and quantitative methods, including questionnaires and individual interviews. The sample was made up of 190 software engineering professionals, considering different workloads, lengths of experience, genders and companies. It revealed that 48.5% of participants presented moderate to very severe anxiety symptoms, 55.3% of depression for the same severity range and 53.8% of stress symptoms also for the same severity. Further linear regression analyses demonstrated that feeling valued, being able to cope with workload, and balancing professional and personal life were predictors for the emergence of symptoms of anxiety, depression, and stress. Finally, no significant differences were identified in the levels of anxiety, depression, stress and job satisfaction in relation to the loads held by the participants, but significant differences were noticed in relation to the variables listed above when comparing groups of different age ranges, severity of symptoms of anxiety, depression and stress. Groups with higher levels of symptoms demonstrated less balance between professional and personal life and a lower feeling of appreciation for the team, while for the group with fewer symptoms the result was the opposite.

CCS CONCEPTS

• **Software and its engineering → Programming teams**.

KEYWORDS

Depression, Anxiety, Stress, Mental health, Software Engineering

1 INTRODUCTION

Software engineering plays a vital role in modern society, driving technological advancement and meeting the growing demands for innovative digital solutions. However, this highly competitive and demanding sector also presents significant challenges for the professionals involved. With tight deadlines, pressure for results, and intensive teamwork, software engineering can become a breeding ground for the development of symptoms of neuropsychiatric disorders, such as depression and anxiety.

The anxiety rate among software professionals is significantly higher than the average in other professions not related to technology [16]. This is quite concerning and underscores the need and urgency to promote a healthy and inclusive work environment for these professionals. As a reflex of this important issue, the Software Engineering research community has a growing interest in developing studies highlighting the importance of understanding and addressing the mental health of software engineering professionals [7, 9, 32], which was especially a major concern during the COVID-19 pandemic [4, 15, 21].

The mental health of software engineers is a critical issue, as it is intrinsically linked to productivity, work quality, and job satisfaction. Depression and anxiety can negatively impact professionals' ability to focus, make decisions, cope with stress, and interact effectively with the team. As a result, individual and organizational performance can be affected, resulting in delays, errors, and overall job dissatisfaction. In this context, it is essential to explore strategies and measures that can improve the mental health of software engineering professionals and promote the inclusion of these individuals. By understanding the challenges faced by these professionals and the best practices adopted by companies, it is possible to implement psychological support programs, awareness training, and favorable organizational policies. These measures can contribute to a healthier, more inclusive, and productive work environment where professionals can thrive and achieve their maximum potential. In summary, despite its positive impact, software engineering presents significant challenges in terms of mental health and inclusion. Understanding depression, anxiety, and stress behaviors in this context and implementing measures to promote mental health and inclusion are essential to ensure a healthy and productive work environment.

As an interdisciplinary work involving researchers from the Computer Science and Psychology fields, this research aims to

investigate the relationship between job satisfaction and the occurrence of symptoms of anxiety, depression, and stress in software engineers and explore the organizational management of these activities concerning employee well-being. In this study, we pioneer the exploration of the relationship between job satisfaction and the occurrence of symptoms of anxiety, depression, and stress in software engineers, as measured by the Depression Anxiety Stress Scales (DASS-21) [14]. This approach marks the first of its kind in the field, offering new insights into how these psychological factors correlate with job satisfaction in the unique context of software engineering. We aim to: (1) increase the understanding of the relationship between software engineering and behaviors or symptoms of depression, anxiety, and stress, as well as to investigate inclusion practices and measures to promote mental health in the context of software engineering; (2) analyze whether the execution of specific activities in software engineering can trigger or exacerbate depression, anxiety, and stress behaviors, and (3) check the correlation between the level of job satisfaction with the incidence of symptoms of depression, anxiety, and stress in software engineers. As contributions, we expect to contribute to the advancement of knowledge in the area and provide practical guidelines for software companies, managers, and professionals interested in promoting inclusion and mental health in the workplace in software companies.

2 BACKGROUND

2.1 Mental Health Aspects

We focus on an overview of neuropsychiatric disorders focusing on anxiety, depression, and stress disorders. We present the fundamental concepts of these conditions, including their causes and characteristic symptoms, and how they can impact activities and interpersonal relationships in the corporate environment. Understanding that is essential to grasp the impacts of these disorders on software engineering and inclusion practices in the workplace.

2.1.1 Anxiety. Anxiety disorders are one of the most common mental disorders, affecting 301 million people in the world in 2019 [33]. In the first year of the COVID-19 pandemic, there was an increase of anxiety and depression by a massive 25% [19]. An Anxiety Disorder is characterized by a permanent feeling of worry, fear without a specific object, or acute restlessness, most of the time disproportionate to reality. Understanding the main aspects of anxiety is essential to identify, treat, and promote emotional well-being. Anxiety behaviors can be triggered by various factors, such as chronic stress, genetic predisposition, and chemical imbalances in the brain [31]. It can be acquired throughout life through negative experiences, such as abuse, neglect, or traumatic events. These events can generate intense alert and fear responses, which become exaggerated and disproportionate in everyday situations. The symptoms of anxiety can vary from person to person, in greater or lesser intensity, but generally include excessive worry, irritability, difficulty concentrating, muscle tension, insomnia, and panic attacks. Anxiety can also cause, among other symptoms, palpitations, dry mouth, sweating, difficulty breathing, feeling of choking, chest pain, and nausea [30]. These symptoms interfere with people's routines and often end up being decisive in most cases. Anxiety not only affects emotional health but can also have medium and long-term consequences beyond physical and social (e.g., cardiovascular diseases, diseases related to the gastric apparatus, compromised immune system, sleep-related disorders) [10]. In addition, anxiety can lead to social isolation, resulting in difficulty in interpersonal relationships and limitations in professional and academic activities. In the corporate environment, it directly impacts productivity, due to difficulty in concentrating or the mind going blank and generates feelings of incapacity and demotivation in employees [27, 30].

2.1.2 Depression. Like anxiety, depression can be a neuropsychiatric disorder that affects approximately 121 million people worldwide, characterized by a deep feeling of sadness, fatigue, hopelessness, and lack of interest in everyday events. Scientific studies have shown that depression can be caused by a combination of biological, psychological, and environmental factors. Medical research associates the occurrence of depression with chemical imbalances in the brain, such as decreased serotonin levels, a neurotransmitter responsible for mood regulation. In addition, stressful life events, such as traumas, abuse of alcohol and other drugs, previous neurological conditions, and even genetic factors, can trigger or aggravate depressive symptoms [29]. The symptoms of depression, in most cases, include persistent sadness, apathy, low self-esteem, changes in sleep and appetite, difficulty concentrating, and in more severe cases, recurrent thoughts of imminent death and suicide. As expected, these symptoms affect the entire routine of the person living with this disorder, and consequently end up harming the individual's performance in the workplace, causing a constant feeling of fatigue and demotivation, resulting in delays, accumulation of activities, and a drop in productivity. It is important to note that although there is a great taboo about this disorder, depression should not be confused with laziness or lack of will. Depression is a legitimate and concerning medical condition that can affect anyone and should be treated with the same care and responsibility as any other disease. Promoting awareness about depression is fundamental to end the stigma about the disease and all the harm that accompanies it.

2.1.3 Stress. Stress is a natural body response to challenging or threatening situations and can significantly affect people's health and well-being. In the field of software engineering, professionals often face a series of challenges and demands that can contribute to high stress levels. According to studies, stress in the workplace is associated with a series of health problems, including cardiovascular problems, mental disorders, and decreased quality of life [3]. In the specific context of software engineering, factors such as intense workloads and highly competitive work environments can contribute to high stress levels [24]. In addition, chronic stress can have a negative impact on the mental health of software engineering professionals. Research shows an association between high stress levels and the development of anxiety and depression disorders [6]. Professionals who constantly deal with tight deadlines and intense demands may experience symptoms such as irritability, lack of energy, difficulty concentrating, and mood swings [25]. It is important to note that stress not only affects the individual but can also have significant impacts on organizations. High stress levels can lead to decreased productivity, increased absenteeism, and higher employee turnover. Thus, stress management in the workplace is essential to promote a healthy and productive environment.

One of the instruments to measure these three emotional states is the Depression, Anxiety and Stress Scale (DASS-21). It is a self-report questionnaire consisting of a test with 21 items addressing symptoms of depression, anxiety, and stress [14], which is a widely adopted instrument that has been validated in various cultures [18].

2.2 Potential work environment triggers to neuropsychiatric disorders

This subsection aims to present the main demands and activities of software engineering that can contribute to the development of symptoms of neuropsychiatric disorders as mentioned in the previous section. The challenges faced by professionals, the possible consequences for their mental health, and how this impacts performance and the corporate environment will be addressed. Understanding these issues is essential for analyzing the experiment that will be developed and presented later.

2.2.1 Impacts on the mental health of employees. The demands and activities of software engineering can have a significant impact on the mental health of professionals. The fast-paced work environment, the requirement to deal with customer inconsistencies, tight delivery deadlines, the need to deal with project complexity, and the constant need to adapt to technological changes are just some of the factors that can contribute to the onset of disorders such as anxiety, depression, and burnout. According to Singh et al [24], the most common causes of stress among software engineers are the pressure to meet tight deadlines and the demand for high productivity. These constant pressures can lead to high levels of anxiety, especially when combined with the uncertainty and complexity of projects. In addition, the collaborative nature of software engineering poses additional challenges to the mental health of professionals. The need for teamwork, constant and assertive communication, and the pressure to solve complex problems can lead to the emergence of interpersonal conflicts, increasing stress and contributing to the development of emotional disorders. Furthermore, the constant technological update is an additional demand for software engineering professionals. The need to always be in continuous learning and the pressure to stay updated with every technology upgrade can generate a feeling of overload and require an additional effort to adapt to changes. This constant demand can contribute to the onset of anxiety and stress symptoms.

2.2.2 Job satisfaction. Job satisfaction is a fundamental element for professionals' well-being, directly influencing their motivation, productivity, and quality of life. In the field of software engineering, where professionals face technical challenges and constant demands, job satisfaction plays a key role. Studies show that job satisfaction is related to various positive aspects, such as greater organizational commitment, lower employee turnover, and better individual and collective performance [12]. Satisfied professionals tend to feel valued, engaged, and more likely to stay with the organization in the long term. Additionally, job satisfaction is closely linked to the mental health of professionals. Research indicates that low levels of job satisfaction are associated with a higher risk of developing symptoms of anxiety, depression, and stress [20] On the other hand, satisfied professionals tend to have a better work-life balance, greater resilience to stress, and an improved perception of overall well-being [22]. Job satisfaction is not determined solely by salary or benefits, but also by factors such as a healthy work environment, opportunities for growth and professional development, recognition, and support from leadership [2]. Thus, software companies must be attentive to that and seek strategies to promote job satisfaction among employees.

2.3 Related work in Software Engineering

A growing body of literature underscores the intricate relationship between mental health, emotions, and job satisfaction in the field of software engineering. Many of the findings suggest that organizations and team leaders should prioritize emotional well-being and mental health support as part of their strategy to enhance job satisfaction and productivity among software engineers. Kurian et al. [13] emphasize the critical role of emotions in software development. They argue that positive emotions not only enhance developers' well-being but also contribute significantly to their performance and efficacy. This perspective aligns with the findings of Marinho et al. [15], who observed that happiness positively influences team behavior and productivity, while unhappiness has the opposite effect. These studies collectively suggest that managing emotions, particularly by fostering positive feelings, can be a strategic approach to improving both individual and team performance in software engineering. Graziotin et al. [9] explore the consequences of happiness and unhappiness among software developers. Their research identifies various effects of these emotional states on mental well-being, the software development process, and the quality of the produced software. This analysis underscores the need for a better understanding of the emotional landscape in software development, suggesting that enhancing happiness and mitigating unhappiness can lead to more effective working conditions and improved job performance. Wong et al. [32] focus on the mental wellbeing of software engineers, exploring the challenges they face at individual, team, and organizational levels. Authors highlighted the complexity of mental wellbeing management and the necessity of addressing it through multifaceted strategies, including technological and organizational solutions. This perspective is fundamental for developing effective support systems for mental wellbeing in the workplace, which is essential for maintaining high levels of job satisfaction and productivity. In a related study, Nishikitani et al. [17] discusses the complex interaction between excessive work, sleep duration, and perceived job characteristics, and their effects on the physical and mental health of software engineers. This research is pivotal in understanding the prevalence of overtime in the software engineering industry and its impact on engineers' well-being. It underscores the significance of considering various factors, including work demands and organizational support, to fully comprehend the relationship between health and the work environment in the software industry. However, this study primarily focuses on the relationships between overtime, sleep duration, and job characteristics, suggesting a need for further research into the emotional impacts on engineers, such as symptoms of anxiety, depression, and stress.

The particular case of the COVID-19 pandemic significantly disrupted the work environment of software engineers, leading to a shift towards remote work. Russo et al. [22] conducted a study to

understand the impact of this shift on software engineers' satisfaction and productivity. They found that while the nature of activities (like coding and bugfixing) remained consistent with pre-pandemic times, factors such as autonomy in work significantly influenced job satisfaction and productivity. This highlights the importance of supporting developers' needs for autonomy and relatedness, especially in a work-from-home context.

Tulili et al. [28] performed a mapping study of studies about burnout – a work-related syndrome – in software engineering professionals. They identified 32 primary studies focusing on factors that cause or lead to burnout, primarily work-related such as job tension, overload, role conflict, and job demands. Communication practices within development teams also play a role, with factors like lack of participation and impolite requests contributing to burnout. The consequences of burnout, particularly turnover, physical, and psychological health issues, were also discussed, along with indirect links between causes like work exhaustion and turnover intention. This analysis led to the creation of a map connecting various causes and potential consequences of burnout.

Literature about the usage of the DASS-21 instrument to measure the emotional states of depression, anxiety, and stress in software developers is very limited. Only one study cited part of the surveyed professionals as being software developers [23], although it is not exclusively focused on that public since it involved respondents from other occupations (e.g., pharmaceutical industry, banking, sales and marketing). In regards to anxiety and depression and Software Development, a study from 2006 [26] focused on the relation of agile methods and levels of anxiety and depression. The author's interpretation of agile methodologies, particularly XP, significantly oversimplifies anxiety and depression in software developers. By attributing reduced anxiety and depression levels to XP practices, it overlooks the complex, multifactorial nature of these neuropsychiatric disorders. Using students as subjects further limits the study's relevance to professional settings. This oversimplification risks trivializing serious mental health issues and misguides the software development community on the nature and management of anxiety and depression in software developers.

3 METHOD

This study was designed by the three authors: two Computer Scientists and a Psychologist. An undergraduate psychology student (8th semester) experienced with psychometric instruments joined the research team after data collection. Our hypothesis is based on the premise that there is a relationship between the constructs: level of depression, level of anxiety, level of stress, and job satisfaction in software engineering professionals.

In this study we adopted a cross-sectional approach and used a mixed-methods for data collection and analysis. The research environment was online, for reasons of practicality and availability of participants, where all data collection procedures were conducted, eliminating the need for a specific physical space. The schedule set for the study consisted of 6 stages: the construction of the project documentation, the submission of the project to the research ethics committee [1], approval by the ethics committee, the dissemination of the questionnaire, the interviews, and finally the data analysis.

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3.1 Sample and Participant Recruitment

The initial sample of participants consisted of 192 Brazilian professionals from various areas of software engineering who met the previously established inclusion criteria, such as being over 18 years old, employment in the field in the last 3 months, and a minimum experience of 1 year. Out of the respondents, 2 were not counted for analysis as they did not complete the quantitative survey. The selection of participants was done conveniently, aiming for a representative diversity of hierarchical levels, experiences, and companies. Recruitment for this study was conducted to ensure the necessary diversity for a research. The procedure was carried out through invitations via email and on social media, inviting software engineers to fill out a research form and, if available and interested, to participate in an interview. Participation was voluntary, ensuring anonymity and confidentiality. Only 4 people contacted us to participate in the interview, among which only three allowed it to be recorded and one preferred to speak off the record. Thus we did not consider any interview data in our analysis.

3.2 Data Collection

Data collection was carried out using the four instruments detailed in this section: a brief sociodemographic Questionnaire; a Work Environment Questionnaire (Table 1); the Depression Anxiety Stress Scales (DASS-21) test for assessing symptoms of depression, anxiety, and stress (Table 2), and a Job Satisfaction Scale (Table 3).

To better understand the participants, a short questionnaire was developed to assess the following demographic aspects: age, gender, role performed in Software Engineering, and years of experience.

Table 1: Software Engineering work environment questions

1. (Stressful Activities) Which of the following software engineering activities do you believe can cause more symptoms of anxiety? (Development of new features or functionalities, Emergency problem solving, Testing and bug fixing, System integration and software deployment, Product design, Communication with clients, Sudden changes in project scope)
2. (Pressure to deadlines) How often do you feel pressure to meet tight deadlines in software engineering? (Always, Frequently, Sometimes, Rarely, Never)
3. (Handle Pressure) On a scale of 0 to 10, with 0 being very poorly and 10 being very well, how do you handle the demands and pressures of work in software engineering?
4. (Workload Level) What is the level of workload you face in software engineering?
5. (Organization Suport) How would you describe the organizational support regarding mental health at your job?
6. (Feeling of Appreciation) Do you feel included and valued by the software engineering team?
7. (Work Balance) How often do you have opportunities to balance your professional and personal life working in software engineering?
8. (Satisfaction) On a scale of 0 to 10, with 0 being very dissatisfied and 10 being very satisfied, what is your level of satisfaction with your current job in software engineering?
9. (Participation in Training) How often do you participate in training and capacity-building activities in software engineering?
10. (Feeling Coercion) Have you ever felt coerced to accept a task that was not in your job scope for fear of being poorly viewed by your superiors?

Table 2: Questions about stress (s), anxiety (a) and depression (d) of the DASS-21[14]

1. (s) I found it hard to wind down
2. (a) I was aware of dryness of my mouth
3. (d) I couldn't seem to experience any positive feeling at all
4. (a) I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion)
5. (d) I found it difficult to work up the initiative to do things
6. (s) I tended to over-react to situations
7. (a) I experienced trembling (e.g () In the hands)
8. (s) I felt that I was using a lot of nervous energy
9. (a) I was worried about situations in which I might panic and make a fool of myself
10. (d) I felt that I had nothing to look forward to
11. (s) I found myself getting agitated
12. (s) I found it difficult to relax
13. (d) I felt down-hearted and blue
14. (s) I was intolerant of anything that kept me from getting on with what I was doing felt
15. (a) I was close to panic
16. (d) I was unable to become enthusiastic about anything
17. (d) I felt I wasn't worth much as a person
18. (s) I felt that I was rather touchy
19. (a) I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat)
20. (a) I felt scared without any good reason
21. (d) I felt that life was meaningless

As a method of probing aspects related to the work environment, we formulated questions based on informal conversations with developers working in the field with varying levels of experience. The questionnaire items were designed to assess the following professional perceptions: Feeling pressured to meet deadlines; Ability to handle pressure; Workload; Level of organizational support; Feeling of being valued; Ability to balance personal and professional life; Job satisfaction; Participation in training programs; Coercion to accept new demands outside the project scope. These items are in accordance with many aspects related to burnout outcomes identified by Tulili et al. [28] (e.g., Stress and productivity, well-being and personal health, time pressure and productivity). The primary objective of this questionnaire is to investigate possible variables related to the work environment that may be associated with symptoms of stress, anxiety, and depression.

Each item of the DASS-21 (Table 2) is rated on a scale of 0 to 3, indicating the frequency with which the symptom was experienced by the participant over the past few weeks: (0) Did not apply to me at all; (1) Applied to me to some degree, or some of the time; (2) Applied to me to a considerable degree or a good part of time; and (3) Applied to me very much or most of the time. The total score on each subscale (depression, anxiety, and stress) is obtained by summing the answers of the corresponding items and multiplying by two to determine the severity level. Including the DASS-21 in the study allows for a more comprehensive assessment of participants' symptoms of depression, anxiety, and stress, providing additional relevant information for understanding the psychological impacts of activities in software engineering.

Table 3: Team behaviors perspective from [15] that were used to capture job satisfaction in our questionnaire

1. (Transparency) The development cycles' tasks and goals were always disposed of in an accessible mode to everyone from my team, which eased communication and made me more engaged and satisfied.
2. (Team learning) I understand my tasks' importance, and I am free to choose and learn during their execution. It cheers me up and positively affects my performance.
3. (Autonomy) My team makes decisions and discusses the whole software development process cohesively and objectively. It makes me feel included and positively affects my performance.
4. (Creativity) Generating new ideas is something recurrent and easy for me within the project. That way I become more and more creative, impact more on results and feel meaningful and happy.
5. (Challenging Environment) My work environment shows up as challenging and full of decisions to be made daily. It positively affects my performance.
6. (Alignment) Customers' expectations and my team's reality are constantly aligned, including everyone from the team, making the software development process's experience engaging and pleasant.
7. (Team spirit) My teammates are always available and willing to help with any issue or doubt I might have. It promotes more security and team spirit, which positively affects my task's performance.
8. (Defined process) There are well-defined processes for the whole software development cycle in my project, and it makes our development execution better planned and carried out, consequently promoting a better experience to me.
9. (Agility) My project follows agile practices for software development, and I'm aware of each step, contributing with the team to achieve all of their goals.
10. (Leadership) The project's leaderships are always open to help and motivate me during the whole software development process, recognising my wins and successes, making me happy and eager to improve each day.
11. (Good communication) During the pandemic, communication between my team members happens quickly and effectively, both formally and informally. This communication positively affects my performance.
12. (Focus) I tend to keep my attention on my activities even if they become complex and laborious. If it takes time to resolve, I start to get stressed and feel incapable.
13. (Decision making) When I feel good, I make better choices for project maintenance and look for new activities or help other colleagues as soon as I finish my demands. However, I feel helpful and vital to the team, which makes me feel good.

To avoid an excessively long questionnaire, we considered simplified perspective of job satisfaction the scale about the team behaviors perspective from [15], which we only removed the COVID-19 perspective present in three statements. The questionnaire consists of 13 statements addressing a specific aspect of the work environment and its possible influences on participants' mental health and satisfaction. Each item is rated on a scale of 1 to 5, according to the degree of agreement with each statement, where 1 means strongly disagree and 5 means strongly agree. The inclusion of this questionnaire in the study aimed to assess the perceptions of software engineering professionals about various aspects related to the work environment, such as autonomy, team relationships, among others.

3.3 Data Analysis

The data collected from the survey was subjected to an analysis to derive meaningful insights regarding the mental well-being and job satisfaction of the participants. The following steps were undertaken to analyze the data:

(1) **Severity Level Assessment:** Based on the DASS-21 assessment [14], indices of anxiety, depression, and stress were obtained. Participants were categorized into different severity levels ranging from mild to extremely severe.
(2) **Activity Impact Analysis:** Participants were allowed to choose multiple options to indicate activities that heightened their stress and anxiety levels. The frequency of each activity was then calculated to determine its impact.
(3) **Job Satisfaction Analysis:** Participants' responses were clustered on a scale to determine their overall job satisfaction level.
(4) **Correlation Analysis:** The Spearman correlation test was employed to determine the relationship between various variables. The correlation coefficient was used to classify the strength of the relationship. The Bonferroni correction was applied to reduce the type I error rate.
(5) **Reliability Assessment:** To ensure the reliability of the study, Cronbach's alpha coefficient was calculated for DASS-21 and the job satisfaction scale. This helped in assessing the internal reliability of the instruments used in the study.
(6) **Multiple Linear Regression** Multiple linear regression model was used for better understanding of variable relations with the intensity of mental heath symptoms
(7) **Group Comparison:** Non-parametric Mann Whitney U Tests were conducted to compare different groups. The first test compared software developers with other positions, while the second test compared high-risk participants with low-risk participants based on their scores on the DASS-21.

The data was then visualized using various graphs to provide a clear representation of the findings. The results from the analysis were used to confirm the hypotheses presented earlier in the study. The insights derived from the data analysis was fundamental to understand the factors affecting the mental well-being and job satisfaction of software engineering professionals.

4 RESULTS

4.1 Participant Profile

The final sample consisted of 190 participants, detailed in Table 4. Among those respondents, 149 were men (78.4%) and 41 were women (21.6%). The predominant age range was between 26 and 35 years (56.5%), followed by 31.1% aged between 18 and 25 years, 11.6% between 36 and 40 years, and only 6.8% aged over 40 years. Regarding the length of experience in the field, the proportion remained quite balanced with 33.9% of participants having over 6 years of experience, followed by 30.2% with experience between 4 and 6 years, 30.2% between 1 and 3 years, and less than 6% with experience under 1 year. As for the activities each participant performs in their daily work, the majority were involved in software development activities, representing almost 80.5% of the total, followed by 4.2% in design-related activities, 3.2% for project management and requirements analysis activities, 4.7% for software quality-related activities, and the remainder for other activities such as support, infrastructure, and data science-related activities. Table 4 shows the profile of the participants.

Table 4: Participants demographics (n=190)

Characteristic	n (%)
Gender	
Man	149 (78.4%)
Woman	41 (21.6%)
Age range	
18-25 years old	59 (31.1%)
26-35 years old	96 (50.5%)
36-40 years old	22 (11.6%)
40+	13 (6.8%)
Experience	
< 1 year	11 (5.8%)
1-3 years	57 (30.2%)
4-6 years	57 (30.2%)
6+ years	64 (33.9%)
Position	
Software development	153 (80.5%)
Product or Interface Design	9 (4.7%)
Management or Requirements Analysis	10 (5.3%)
Testing and Software Quality	9 (4.7%)
Others	9 (4.5%)

4.2 Anxiety, Depression, and Stress Levels

According to the severity level assessment proposed by the original DASS-21 study [14], we obtained our indices of anxiety, depression, and stress among the survey participants, ranging from mild to extremely severe. Our study showed that 48.5% of participants exhibited moderate to extremely severe symptoms of anxiety; 55.3% showed the same severity level for depression (from moderate to extremely severe), and regarding stress, for the same severity range, the figure was 53.8%. Figure 1 shows the number of participants detailed by severity level.

Regarding the impact that certain activities have on the stress and anxiety levels of employees, we obtained interesting results. At this stage, each participant could choose more than one option. Thus, 88.9% of participants stated that activities such as fixing emergency issues tend to cause more symptoms of anxiety, 78.4% responded that sudden changes in project scope have a high potential to cause these symptoms, 53.2% pointed to communication with clients as a cause; 36.8% highlighted system integration and deployment as the problem, and the remaining participants stated that the possible causes would be tests/bug fixes and product conception activities.

4.3 Job Satisfaction Level

Regarding the level of job satisfaction, the results showed a significant pattern. The final result was obtained by clustering the number of participants on a scale from 5 to 65 points, where 5 means very dissatisfied and 65 very satisfied, considering that the questionnaire has 13 questions that can be answered on a scale of 1 to 5 points. The final estimate showed that the vast majority of participants (53.15%) are at the midpoint of the scale, that is,

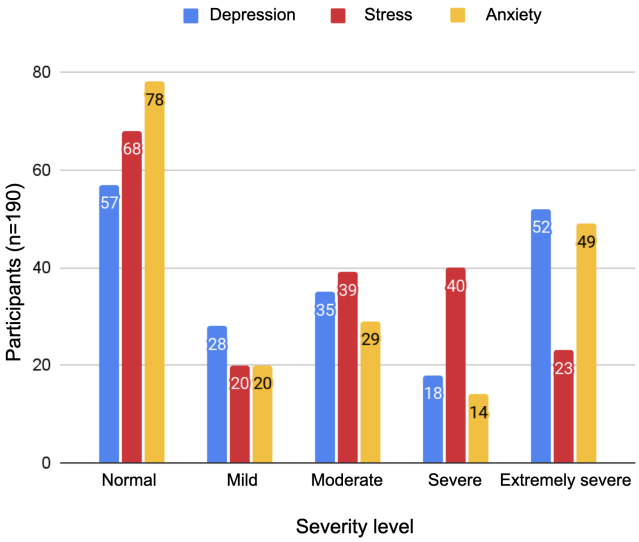

Figure 1: Number of participants grouped by severity levels of depression, anxiety, and stress according to DASS-21.

neither satisfied nor dissatisfied. Next, we have the second largest number, the participants who are at the far right of the scale, being 32.10% of the total amount, representing the satisfied ones. In the graph illustrated by Figure 2, it is possible to observe the number of participants according to the scoring scale.

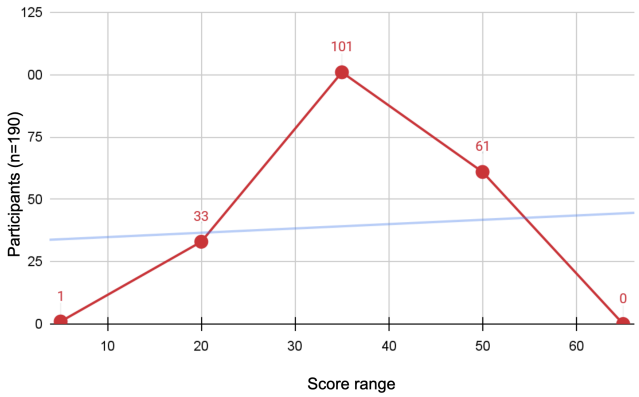

Figure 2: Number of participants according to the level of job satisfaction

4.4 Correlation Between Variables and Study Reliability

The Spearman correlation test was used to calculate the correlation between the variables, where the correlation coefficient can be classified as very weak correlation, weak correlation, moderate correlation, strong correlation, and very strong correlation as per the supplementary material [1]. A total of 16 variables were evaluated, which include: age, experience duration, pressure to meet deadlines, ability to handle pressure, workload level, organizational support, feeling of appreciation by the team, balance between professional and personal life, satisfaction, participation in training, feeling of coercion by superiors, symptoms of depression, symptoms of anxiety, and symptoms of stress. To reduce the type I error rate, the Bonferroni correction was applied where $\rho \leq 0.003$.

The Spearman correlation coefficients [2] showed significant correlations for five items of the construct and pressure to meet deadlines. The most significant correlations were in relation to: workload level ($rs = 0.43$, $\rho \leq 0.003$, $n = 190$), feeling of appreciation by the team ($rs = -0.32$, $\rho \leq 0.003$, $n = 190$), balance between professional and personal life ($rs = -0.41$, $\rho \leq 0.003$, $n = 190$); feeling of coercion by superiors ($rs = 0.33$, $\rho \leq 0.003$, $n = 190$) and stress level according to DASS ($rs = 0.26$, $\rho \leq 0.003$, $n = 190$). According to these correlations, it is inferred that the higher the workload, the greater the pressure to meet deadlines; the greater the pressure to meet deadlines, the lower the feeling of appreciation by the team; the greater the pressure to meet deadlines, the lower the balance between professional and personal life; and the greater the pressure to meet deadlines, the higher the stress level. The constructs of feeling of appreciation by the team, balance between professional and personal life, overall job satisfaction, and organizational support also showed significant correlation values. For the construct and feeling of appreciation by the team, the most significant correlations were: overall job satisfaction ($rs = 0.53$, $\rho \leq 0.003$, $n = 190$), depression level according to DASS ($rs = -0.41$, $\rho \leq 0.003$, $n = 190$), and stress level according to DASS ($rs = -0.39$, $\rho \leq 0.003$, $n = 190$).

For worklife balance (i.e., balance between professional and personal life), the most significant correlations were: overall job satisfaction ($rs = 0.39$, $\rho \leq 0.003$, $n = 190$), depression level according to DASS ($rs = -0.33$, $\rho \leq 0.003$, $n = 190$), anxiety level according to DASS ($rs = -0.32$, $\rho \leq 0.003$, $n = 190$), and stress level according to DASS ($rs = -0.34$, $\rho \leq 0.003$, $n = 190$).

Based on this, it is possible to state that, for the given sample, the balance between personal and professional life is directly linked to the level of job satisfaction while it is inversely proportional to the levels of disorders measured by DASS, that is, the lower the balance between personal and professional life, the higher the symptoms of anxiety, depression, and stress. Regarding overall job satisfaction, the most significant correlations were: depression level according to DASS ($rs = -0.50$, $\rho \leq 0.003$, $n = 190$) and stress level according to DASS ($rs = -0.40$, $\rho \leq 0.003$, $n = 190$). The results presented in this testing phase confirm the previously presented hypothesis that factors such as workload, and lack of balance between personal and professional life, combined with the absence or inefficiency of adequate assistance and guidance from leadership, have a significant correlation with the levels of anxiety, depression, and stress among software engineering professionals and directly affect job satisfaction.

To assess the reliability of the study, Cronbach's alpha coefficient was calculated for DASS-21 and for the job satisfaction scale, for which we obtained values of 0.93 and 0.82, respectively. These values indicate good internal reliability for the instruments used and suggest that the questions in the questionnaire are reliably measuring the constructs of interest. In addition, the high internal reliability mentioned indicate that, if the same group of participants were evaluated again with the same instruments, the results would

[2]The correlations of all variables can be found in the supplementary material [1]

likely be consistent, reinforcing the validity of the instruments used in data collection.

4.5 Multiple Linear Regression

The Pearson correlation analyses indicated that more robust methods could be used to understand how the variables might be related. Therefore, a multiple linear regression model was established. As the dependent variable of the model, the sum of the scores collected in the DASS-21 for the Stress, Anxiety, and Depression factors was used as a way to represent a general measure related to symptoms of mental health. For the independent variables of the study, the items present in the correlation analysis were used, with the only exception being the Satisfaction variable, for which the score measured through the Job Satisfaction instrument was used.

Thus, we sought to investigate whether any variable linked to aspects of the work environment and satisfaction would be statistically significant as predictors for the manifestation of joint symptoms of anxiety, depression, and stress. The method chosen to establish the regression was Stepwise, in which the predictor variables are sequentially inserted into the model, and at each iteration, the least significant variable is removed.

The predictor variables in the established model after the iterations were: Feeling of appreciation ($\beta = -0.301$, $\rho \leq 0.001$), Ability to handle pressure ($\beta = -0.253$, $\rho \leq 0.001$), and Balance between professional and personal life ($\beta = -0.182$, $\rho = 0.012$) as can be observed on Table 5. It is important to note that the variable measuring the feeling of being valued has almost twice the effect in the regression model compared to the variable that aims to measure the ability to balance work and personal life. The other variables, including job satisfaction, were not statistically significant to be considered predictors for the dependent variable.

Based on these results, it is understood that there is a relationship between the emergence of symptoms of anxiety, depression, and stress and factors arising from the work environment in the context of software engineering. Based on the regression data, it is possible to identify that individuals working in this context who are more valued in the workplace, who are more skilled in handling pressure, and who are more capable of achieving a balance between professional and personal life tend to exhibit lower levels of combined anxiety, depression, and stress symptoms.

4.6 Comparison between groups using non-parametric tests

Two comparison experiments between groups were conducted using the non-parametric Mann Whitney U Test for comparison. The first test aimed to evaluate the significance level of the variables for the constructs based on two distinct groups: the group of software developer participants and another large group that included all other positions, not related to software development, listed in the survey (designers, analysts, managers, among others). For this test, after the Bonferroni correction with $\rho \leq 0.003$ and $n = 190$, it was found that there is no significant difference in relation to any of the variables when comparing the participants' positions. That is, statistically, according to the test results, the levels of anxiety, depression, stress, and job satisfaction do not depend on the position held. The second test aimed to evaluate the significance level of the variables for the constructs also based on two groups: the group that includes the high-risk participants (HRP) and the group that includes the low-risk participants (LRP). That is, the objective was to verify if the perceptions of the two groups regarding job satisfaction, feeling of appreciation by the team, balance between professional and personal life, and ability to cope with pressure had a significant difference. The classification criterion to integrate each of the groups was the participant's final score on the DASS-21. The participant who scored above 40 points on the questionnaire was classified as HRP and the participant who scored 20 points or less joined the LRP. This test, unlike the previous one, after the Bonferroni correction with $\rho \leq 0.003$ and $n = 190$, showed a significant difference for the construct and pressure to meet deadlines, feeling of appreciation, balance between personal and professional life, and job satisfaction.

For the HRP, it was found that the levels of job satisfaction, feeling of appreciation by the team, and balance between professional and personal life are much lower than the values for the same variables in the LRP. Regarding the ability to cope with pressure, the LRP levels were much higher than those of the HRP. Figure 4 shows the difference between the two groups for each of the variables.

4.7 Discussion

Although the collected data does not allow us to investigate causality, the data analysis revealed important insights about the relationship between the participants' profile and the levels of anxiety, depression, stress, and job satisfaction. Regarding the participants' profile, the collected sample offers a representative portrait of the population of software engineering professionals. According to the results of the quantitative survey, most participants are in the age group of 26 to 35 years. In addition, the balanced distribution in terms of experience in the area is indicative of valuable diversity in the sample. However, it is important to highlight that the lack of diversity in relation to gender represents an important problematic characteristic of the area. As cited in some studies [5, 8, 11], the underrepresentation of women in the area is still a very recurring phenomenon caused mainly by the predominantly male environment that often ends up being intimidating, reproducing practices of a gender-based culture, thus increasingly distancing the female audience despite constant attempts to change this scenario.

Our study highlights the high demand for developers and its correlation with increased anxiety symptoms. This finding aligns with the work of Russo et al. [22], who focus on job satisfaction and productivity, particularly in remote work contexts. While Russo et al. emphasize the importance of autonomy in work, our research uniquely identifies the specific mental health challenges, particularly anxiety, associated with high demand in software development. This extends the conversation by linking sector demand directly to mental health, a perspective less explored in Russo et al.'s work.

Regarding depression and stress rates, our study finds that a significant portion of participants exhibit moderate to extreme symptoms. This empirical evidence supports the theoretical propositions of Wong et al. [32], who propose interventions for mental wellbeing. Our research underscores the urgent need for such interventions, providing practical backing to Wong et al.'s suggestions.

Table 5: Multiple Linear Regression for mental health symptoms

Coefficients					
Variable	Unstandardized	Standard Error	Standardized	t	p
(Intercept)	55.856	4.098		13.631	< .001
Feeling of appreciation	-3.946	0.915	-0.301	-4.312	< .001
Ability to handle pressure	-1.743	0.479	-0.253	-3.640	< .001
Balance between professional and personal life	-2.598	1.017	-0.182	-2.555	0.012

Note. The following covariates were considered but not included: Satisfaction (construct), Pressure to meet deadlines, Workload level, Organizational support, Feeling of coercion by superiors.

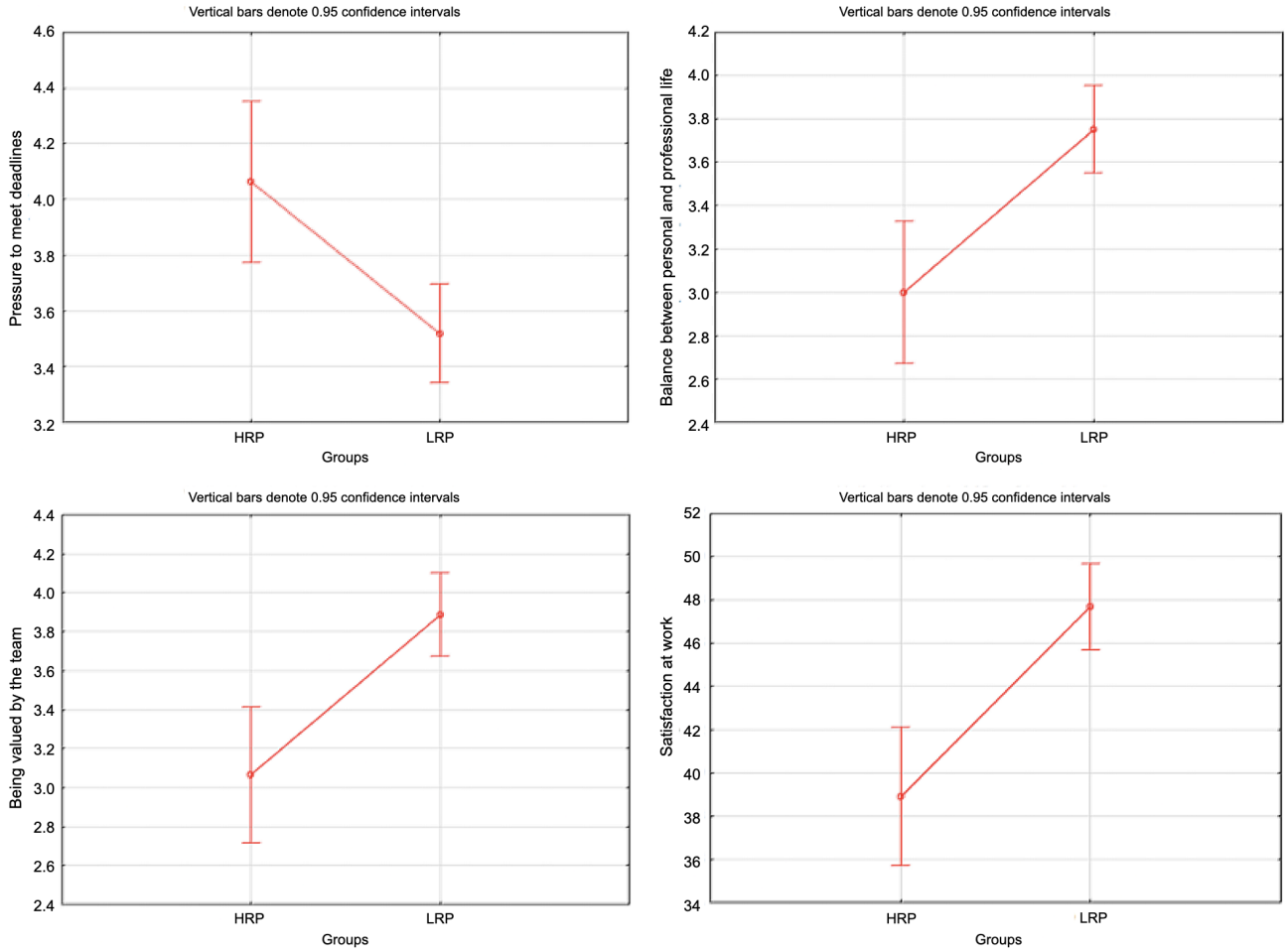

Figure 3: Comparison charts of variables between high-risk participants (HRP) and low-risk participants (LRP) groups

An interesting aspect of our findings is the conflicting reports on anxiety symptoms, suggesting a gap in self-awareness or normalization of these symptoms among software engineers. This aspect of our findings is relatively novel, addressing a gap not explicitly covered in the cited literature. This study introduces a new dimension to the discourse on mental health in software engineering, highlighting the need for better awareness and recognition of anxiety symptoms. Our analysis also reveals that job satisfaction among software engineers is influenced by external factors like organizational support. This aligns with the findings of Graziotin et al. [9], who discuss the impact of happiness and unhappiness on job performance. Our study reinforces and adds empirical evidence to Graziotin et al.'s theoretical framework, providing a more nuanced understanding of the determinants of job satisfaction.

Furthermore, we found that high workload and deadline pressure negatively correlate with team appreciation. This confirms the predictions of Singh et al. [24], who anticipated high demand

contributing to a stressful work environment. Our research elucidates the role of team appreciation in mitigating stress, offering a perspective of workplace dynamics.

We highlight the importance of addressing workplace factors such as feeling valued, possessing pressure management skills, and achieving a balance between professional and personal life in mitigating mental health issues among software engineering professionals. This finding complements the broader narrative in the literature, particularly studies focused on mental well-being and the work environment. We provide concrete evidence linking workplace-related aspects to specific mental health outcomes, emphasizing the importance of supportive policies and practices.

Our study also shows that it is possible to identify workplace variables that are statistically significant in predicting mental health symptoms. Our regression model is aligned with the conceptual model proposed by Tulili et al. in their mapping study [28], where a negative work environment is identified as a predictor for the development of Burnout symptoms. These symptoms are represented by depression and a decline in mental well-being, which are considered in our system as components of stress and anxiety. Accurately identifying the factors in the software engineering work environment that strongly impact the emergence of mental health symptoms is of great importance. By better understanding these predictive variables, it would be possible to prevent their negative effects. Therefore, understanding the role of these variables better enables the development of organizational strategies that seek to mitigate their effect on the emergence of mental symptoms, creating work environments that promote healthier employees.

In addition, the creation of mental health support programs, such as counseling sessions, stress management workshops, and access to mental well-being apps or programs tied to the recognition of professionals' efforts, can play a key role in improving well-being.

4.8 Threats to Validity

It is important to highlight that this study can not be generalizable for the whole Software Engineering field, since it has limitations and threats to validity. The **internal validity** of this study may be compromised by several factors. The use of convenience sampling raises concerns about sample selection bias, as it might not accurately represent the broader population of software engineering professionals. This could affect the generalizability of the findings. The cross-sectional design of the study limits our ability to establish causal relationships between the variables. Regarding **external validity**, the study faces limitations in generalizing its findings to other settings, populations, or times. Conducting the study online may exclude certain demographics, thus affecting the representativeness of the sample. Furthermore, the diversity of the sample in terms of demographics, job roles, and organizational contexts is key for the applicability of the findings. A lack of diversity in these areas could limit the study's relevance to different groups within the software engineering field. In terms of **construct validity**, the study relies on established instruments like DASS-21 and Job Satisfaction scales. While these are generally reliable, their applicability to the specific context of software engineering needs careful consideration to ensure they accurately measure the intended constructs. Our study also relies on a questionnaire about the work environment in Software Engineering, specifically developed for our data collection. Despite having theoretical and empirical evidence that confirms findings from literature, these constructs would need reliability testing.

5 CONCLUSIONS

This study contributes to the advancement in understanding the mental health implications of work demands in software engineering, which is of growing interest in our research community. Utilizing the Depression, Anxiety and Stress Scale (DASS-21) in tandem with job satisfaction perspectives, our research provides novel insights into the prevalence and nuances of anxiety, depression, and stress among software engineers. This approach has revealed correlations and dynamics previously unexplored, enriching our understanding of the mental health landscape within Software Engineering professionals.

Key findings indicate a notable presence of mental health symptoms linked to factors such as excessive workload and deadline pressures. They not only exacerbate anxiety, depression, and stress but also emphasize the critical need for a balanced professional-personal life. This research underscores the importance of team appreciation, showing its beneficial impact in reducing depression and stress levels. Our results highlight the need for organizational practices that prioritize employee recognition and support.

In response to these findings, we propose several practical measures for the software development industry to foster healthier work environments. These include regular workload assessments to prevent burnout, the cultivation of a downtime-valuing work culture, structured feedback policies, automation of repetitive tasks, and the establishment of mental health support programs. These strategies aim not only to improve the well-being and quality of life of software professionals but also to maintain industry productivity and efficiency.

Overall, our study enhances the understanding of how workload and work-life balance impact mental health in software engineering. By identifying key patterns and relationships, it provides a foundation for developing interventions to improve mental health and workplace performance. We advocate for continued research in this area to build upon our findings and further promote the well-being of software engineering professionals.

For future research, a longitudinal follow-up would help to better understand trends over time. Additionally, the inclusion of additional measures, such as coping strategies, combined with the monitoring of participants who will use these strategies, can offer an understanding of the factors that influence the mental health of software engineering professionals and how possible problems can be resolved. A good point to address would also be how other factors, such as socioeconomic ones, also impact the mental health and job satisfaction of professionals in the field so that more assertive cuts can be made regarding these characteristics.

ARTIFACT AVAILABILITY

The survey instrument questions are described in the Method section. The project submitted to the ethics board stated that the data would be kept by the project coordinator and accessible only by the team of researchers involved.

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REFERENCES

[1] Maria Eulália Aires, Lucas Migge, Kiev Gama, and Aline Lacerda. 2024. Exploring the Role of Job Satisfaction and Work-Life Balance: A Study on the Mental Health Among Software Engineers - Supplementary Material. Available on Figshare https://doi.org/10.6084/m9.figshare.26394859.

[2] Hind AlShehhi, Muhammad Alshurideh, Barween Al Kurdi, and Said A Salloum. 2020. The impact of ethical leadership on employees performance: A systematic review. In *International conference on advanced intelligent systems and informatics*. Springer, 417–426.

[3] Georgia Barbayannis, Mahindra Bandari, Xiang Zheng, Humberto Baquerizo, Keith W Pecor, and Xue Ming. 2022. Academic stress and mental well-being in college students: correlations, affected groups, and COVID-19. *Frontiers in Psychology* 13 (2022), 886344.

[4] Jenna Butler and Sonia Jaffe. 2021. Challenges and gratitude: A diary study of software engineers working from home during covid-19 pandemic. In *2021 IEEE/ACM 43rd International Conference on Software Engineering: Software Engineering in Practice (ICSE-SEIP)*. IEEE, 362–363.

[5] Edna Dias Canedo, Heloise Acco Tives, Madianita Bogo Marioti, Fabiano Fagundes, and José Antonio Siqueira de Cerqueira. 2019. Barriers faced by women in software development projects. *Information* 10, 10 (2019), 309.

[6] Sheldon Cohen, Denise Janicki-Deverts, and Gregory E Miller. 2007. Psychological stress and disease. *Jama* 298, 14 (2007), 1685–1687.

[7] Eduardo Santana de Almeida, Ingrid Oliveira de Nunes, Raphael Pereira de Oliveira, Michelle Larissa Luciano Carvalho, Andre Russowsky Brunoni, Shiyue Rong, and Iftekhar Ahmed. 2023. A Snapshot of the Mental Health of Software Professionals. *arXiv preprint arXiv:2309.17140* (2023).

[8] Helen Graham, Vanesa Fuertes, Valerie Egdell, and Robert Raeside. 2016. Women in ICT and Digital Technologies: An investigation of the barriers to women entering, staying, and progressing in the sector, and actions to ameliorate this-Executive Summary. (2016).

[9] D. Graziotin, F. Fagerholm, X. Wang, and P. Abrahamsson. 2018. What happens when software developers are (un)happy. *Journal of Systems and Software* 140 (2018), 32–47.

[10] Martin C Härter, Kevin P Conway, and Kathleen R Merikangas. 2003. Associations between anxiety disorders and physical illness. *European archives of psychiatry and clinical neuroscience* 253 (2003), 313–320.

[11] Sonja M Hyrynsalmi. 2019. The underrepresentation of women in the software industry: thoughts from career-changing women. In *2019 IEEE/ACM 2nd International Workshop on Gender Equality in Software Engineering (GE)*. IEEE, 1–4.

[12] Timothy A Judge, Carl J Thoresen, Joyce E Bono, and Gregory K Patton. 2001. The job satisfaction–job performance relationship: A qualitative and quantitative review. *Psychological bulletin* 127, 3 (2001), 376.

[13] Riba Maria Kurian and Shinto Thomas. 2023. Importance of positive emotions in software developers' performance: a narrative review. *Theoretical Issues in Ergonomics Science* 24, 6 (2023), 631–645.

[14] Peter F Lovibond and Sydney H Lovibond. 1995. The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour research and therapy* 33, 3 (1995), 335–343.

[15] Marcelo Marinho, Luís Amorim, Rafael Camara, Brigitte Renata Oliveira, Marcos Sobral, and Suzana Sampaio. 2021. Happier and further by going together: The importance of software team behaviour during the COVID-19 pandemic. *Technology in society* 67 (2021), 101799.

[16] Ramyashilpa D Nayak. 2014. Anxiety and mental health of software professionals and mechanical professionals. *International Journal of Humanities and Social Science Invention* 3, 2 (2014), 52–56.

[17] Mariko Nishikitani, Mutsuhiro Nakao, Kanae Karita, Kyoko Nomura, and Eiji Yano. 2005. Influence of overtime work, sleep duration, and perceived job characteristics on the physical and mental status of software engineers. *Industrial health* 43, 4 (2005), 623–629.

[18] Tian PS Oei, Sukanlaya Sawang, Yong Wah Goh, and Firdaus Mukhtar. 2013. Using the depression anxiety stress scale 21 (DASS-21) across cultures. *International Journal of Psychology* 48, 6 (2013), 1018–1029.

[19] World Health Organization. 2022. COVID-19 pandemic triggers 25% increase in prevalence of anxiety and depression worldwide. https://www.who.int/news/item/02-03-2022-covid-19-pandemic-triggers-25-increase-in-prevalence-of-anxiety-and-depression-worldwide. Accessed on: Nov. 10, 2023.

[20] Dan Qiu, Ruiqi Li, Yilu Li, Jun He, Feiyun Ouyang, Dan Luo, and Shuiyuan Xiao. 2021. Job dissatisfaction mediated the associations between work stress and mental health problems. *Frontiers in Psychiatry* 12 (2021), 711263.

[21] Daniel Russo, Paul HP Hanel, Seraphina Altnickel, and Niels van Berkel. 2021. Predictors of well-being and productivity among software professionals during the COVID-19 pandemic–a longitudinal study. *Empirical Software Engineering* 26, 4 (2021), 62.

[22] Daniel Russo, Paul HP Hanel, Seraphina Altnickel, and Niels van Berkel. 2023. Satisfaction and performance of software developers during enforced work from home in the COVID-19 pandemic. *Empirical Software Engineering* 28, 2 (2023), 53.

[23] Erman Şentürk, Eser Sağaltıcı, Bahadır Geniş, and Ömür Günday Toker. 2021. Predictors of depression, anxiety and stress among remote workers during the COVID-19 pandemic. *Work* 70, 1 (2021), 41–51.

[24] Pankaj Singh, Damodar Suar, and Michael P Leiter. 2012. Antecedents, work-related consequences, and buffers of job burnout among Indian software developers. *Journal of Leadership & Organizational Studies* 19, 1 (2012), 83–104.

[25] Mochamad Soelton, Putri Ayu Lestari, Harefan Arief, and Ratyuhono Linggarnusantra Putra. 2020. The effect of role conflict and burnout toward turnover intention at software industries, work stress as moderating variables. In *4th International Conference on Management, Economics and Business (ICMEB 2019)*. Atlantis Press, 185–190.

[26] Sharifah Syed-Abdullah, Mike Holcombe, and Marian Gheorge. 2006. The impact of an agile methodology on the well being of development teams. *Empirical Software Engineering* 11 (2006), 143–167.

[27] Ferdinando Toscano and Salvatore Zappalà. 2020. Social isolation and stress as predictors of productivity perception and remote work satisfaction during the COVID-19 pandemic: The role of concern about the virus in a moderated double mediation. *Sustainability* 12, 23 (2020), 9804.

[28] Tien Rahayu Tulili, Andrea Capiluppi, and Ayushi Rastogi. 2023. Burnout in software engineering: A systematic mapping study. *Information and Software Technology* 155 (2023), 107116.

[29] Barbara TURNER, Sankey WILLIAMS, Darren TAICHMAN, Tonya L FANCHER, and Richard L KRAVITZ. 2010. In the clinic Depression. *Annals of internal medicine* 152, 9 (2010).

[30] Peter Tyrer and David Baldwin. 2006. Generalised anxiety disorder. *The Lancet* 368, 9553 (2006), 2156–2166.

[31] Michael W Vasey, Guy Bosmans, and Thomas H Ollendick. 2014. *The developmental psychopathology of anxiety*. Springer.

[32] Novia Wong, Victoria Jackson, André Van Der Hoek, Iftekhar Ahmed, Stephen M Schueller, and Madhu Reddy. 2023. Mental Wellbeing at Work: Perspectives of Software Engineers. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems*. 1–15.

[33] World Health Organization. 2023. Anxiety disorders. https://www.who.int/news-room/fact-sheets/detail/anxiety-disorders. Accessed on: Nov. 10, 2023.