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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

**Медицинские новости Грузии**

საქართველოს სამედიცინო სიახლენი

**GEORGIAN MEDICAL NEWS**

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**GMN: Georgian Medical News** is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board since 1994. GMN carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

**GMN: Медицинские новости Грузии -** ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения. Журнал индексируется в MEDLINE, отражён в базе данных SCOPUS, PubMed и ВИНИТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

**GMN: Georgian Medical News –** საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

ჟურნალი ინდექსირებულია MEDLINE-ის საერთაშორისო სისტემაში, ასახულია SCOPUS-ის, PubMed-ის და ВИНИТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებიდან.

**WEBSITE**

www.geomednews.com

## К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

1. Статья должна быть представлена в двух экземплярах, на русском или английском языках, напечатанная через **полтора интервала на одной стороне стандартного листа с шириной левого поля в три сантиметра**. Используемый компьютерный шрифт для текста на русском и английском языках - **Times New Roman** (**Кириллица**), для текста на грузинском языке следует использовать **AcadNusx.** Размер шрифта - **12**. К рукописи, напечатанной на компьютере, должен быть приложен CD со статьей.

2. Размер статьи должен быть не менее десяти и не более двадцати страниц машинописи, включая указатель литературы и резюме на английском, русском и грузинском языках.

3. В статье должны быть освещены актуальность данного материала, методы и результаты исследования и их обсуждение.

При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи**. Таблицы и графики должны быть озаглавлены.

6. Фотографии должны быть контрастными, фотокопии с рентгенограмм - в позитивном изображении. Рисунки, чертежи и диаграммы следует озаглавить, пронумеровать и вставить в соответствующее место текста **в tiff формате**.

В подписях к микрофотографиям следует указывать степень увеличения через окуляр или объектив и метод окраски или импрегнации срезов.

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

8. При оформлении и направлении статей в журнал МНГ просим авторов соблюдать правила, изложенные в «Единых требованиях к рукописям, представляемым в биомедицинские журналы», принятых Международным комитетом редакторов медицинских журналов - http://www.spinesurgery.ru/files/publish.pdf и http://www.nlm.nih.gov/bsd/uniform_requirements.html
В конце каждой оригинальной статьи приводится библиографический список. В список литературы включаются все материалы, на которые имеются ссылки в тексте. Список составляется в алфавитном порядке и нумеруется. Литературный источник приводится на языке оригинала. В списке литературы сначала приводятся работы, написанные знаками грузинского алфавита, затем кириллицей и латиницей. Ссылки на цитируемые работы в тексте статьи даются в квадратных скобках в виде номера, соответствующего номеру данной работы в списке литературы. Большинство цитированных источников должны быть за последние 5-7 лет.

9. Для получения права на публикацию статья должна иметь от руководителя работы или учреждения визу и сопроводительное отношение, написанные или напечатанные на бланке и заверенные подписью и печатью.

10. В конце статьи должны быть подписи всех авторов, полностью приведены их фамилии, имена и отчества, указаны служебный и домашний номера телефонов и адреса или иные координаты. Количество авторов (соавторов) не должно превышать пяти человек.

11. Редакция оставляет за собой право сокращать и исправлять статьи. Корректура авторам не высылается, вся работа и сверка проводится по авторскому оригиналу.

12. Недопустимо направление в редакцию работ, представленных к печати в иных издательствах или опубликованных в других изданиях.

**При нарушении указанных правил статьи не рассматриваются**.

## REQUIREMENTS

Please note, materials submitted to the Editorial Office Staff are supposed to meet the following requirements:

1. Articles must be provided with a double copy, in English or Russian languages and typed or compu-ter-printed on a single side of standard typing paper, with the left margin of **3** centimeters width, and **1.5** spacing between the lines, typeface - **Times New Roman** (**Cyrillic**), print size - **12** (referring to Georgian and Russian materials). With computer-printed texts please enclose a CD carrying the same file titled with Latin symbols.

2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

8. Please follow guidance offered to authors by The International Committee of Medical Journal Editors guidance in its Uniform Requirements for Manuscripts Submitted to Biomedical Journals publication available online at: http://www.nlm.nih.gov/bsd/uniform_requirements.html
http://www.icmje.org/urm_full.pdf
In GMN style for each work cited in the text, a bibliographic reference is given, and this is located at the end of the article under the title "References". All references cited in the text must be listed. The list of references should be arranged alphabetically and then numbered. References are numbered in the text [numbers in square brackets] and in the reference list and numbers are repeated throughout the text as needed. The bibliographic description is given in the language of publication (citations in Georgian script are followed by Cyrillic and Latin).

9. To obtain the rights of publication articles must be accompanied by a visa from the project instructor or the establishment, where the work has been performed, and a reference letter, both written or typed on a special signed form, certified by a stamp or a seal.

10. Articles must be signed by all of the authors at the end, and they must be provided with a list of full names, office and home phone numbers and addresses or other non-office locations where the authors could be reached. The number of the authors (co-authors) must not exceed the limit of 5 people.

11. Editorial Staff reserves the rights to cut down in size and correct the articles. Proof-sheets are not sent out to the authors. The entire editorial and collation work is performed according to the author's original text.

12. Sending in the works that have already been assigned to the press by other Editorial Staffs or have been printed by other publishers is not permissible.

**Articles that Fail to Meet the Aforementioned Requirements are not Assigned to be Reviewed.**

## ავტორთა საყურადღებოდ!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დავიცვათ შემდეგი წესები:

1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე,დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx.** შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

3. სტატიაში საჭიროა გაშუქდეს: საკითხის აქტუალობა; კვლევის მიზანი; საკვლევი მასალა და გამოყენებული მეთოდები; მიღებული შედეგები და მათი განსჯა. ექსპერიმენტული ხასიათის სტატიების წარმოდგენისას ავტორებმა უნდა მიუთითონ საექსპერიმენტო ცხოველების სახეობა და რაოდენობა; გაუტკივარებისა და დაძინების მეთოდები (მწვავე ცდების პირობებში).

4. სტატიას თან უნდა ახლდეს რეზიუმე ინგლისურ, რუსულ და ქართულ ენებზე არანაკლებ ნახევარი გვერდის მოცულობისა (სათაურის, ავტორების, დაწესებულების მითითებით და უნდა შეიცავდეს შემდეგ განყოფილებებს: მიზანი, მასალა და მეთოდები, შედეგები და დასკვნები; ტექსტუალური ნაწილი არ უნდა იყოს 15 სტრიქონზე ნაკლები) და საკვანძო სიტყვების ჩამონათვალი (key words).

5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემაჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრამების ფოტოასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შეღებვის ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფჩხილებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

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*Содержание:*

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# ASSESSMENT OF PRACTICAL PERFORMANCE IN ORTHODONTIC CLASP FABRICATION AMONG DENTAL TECHNICIAN STUDENTS AT UBT: A REAL-TIME ANALYSIS OF WORKING TIME AND PERCEIVED STRESS

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## Abstract.

**Aim:** This study aimed to assess the impact of stress on the practical performance of dental technician program students in the realization of active or passive elements of removable orthodontic appliances.

**Objectives:** The pivotal objectives of this study were to gauge the time necessary for the completion of an orthodontic clasp or spring, to appraise the level of psychological stress experienced during the procedure using the SUDS scale (Subjective Units of Distress Scale), and to evaluate the final product. These objectives were crucial in understanding the impact of stress on the practical performance of dental technician program students.

**Methods:** The methodology involved 46 second-year students at UBT. During a practical exam, each student randomly selected one of the following orthodontic components: Adam's clasp, double Adam's clasp, C clasp, Jackson clasp, or Spring: Z-spring, closed T-spring, open (finger) spring, which they had practiced throughout the summer semester. Each student was then instructed to randomly select a ticket with the name of the clasp or spring they would be completing, ensuring a fair and unbiased selection process.

- The time needed to complete the basket was measured with a stopwatch, from the moment the work began until its completion.
- Before and after completing the work, students were asked to assess the level of stress experienced through the SUDS (Subjective Units of Distress Scale), which ranges from 0 (I do not feel any stress) to 10 (the highest level of stress imaginable).

**Results:** The results showed a significant negative correlation between stress level and final grade, suggesting that students with lower stress levels performed better. However, no significant relationship was found between stress and the time to complete the paper. Students with low stress had significantly higher grades compared to those with high stress. A gender difference in grades was also identified, with females having higher ratings, but with no significant difference in the reported level of stress. This suggests that factors other than stress may be influencing performance, and further research is needed to understand these factors.

**Discussion:** The findings suggest that stress primarily impairs the quality of academic performance rather than task duration. Effective coping mechanisms, emotional regulation, and contextual factors such as gender and educational support systems play a pivotal role in mitigating stress-induced performance deficits.

**Statistical analysis used:** The data were rigorously analyzed using advanced statistical methods including Pearson correlation, ANOVA, post-hoc Tukey HSD tests, and linear regression. These analyses were instrumental in examining associations between stress and academic performance, differences across stress levels and gender, and the impact of stress on task completion time, ensuring the robustness and reliability of our findings.

**Conclusion:** Stress significantly impairs the quality, but not the speed, of students' practical performance. Female students outperformed males, possibly due to the use of more effective coping strategies. These findings underscore the importance of integrating stress management into dental curricula and adopting holistic assessment approaches in practical professional programs. By doing so, we can foster both competence and resilience in our future dental professionals.

**Key words.** Stress, practical performance, orthodontic clasp.

## Introduction.

The assessment of students' practical skills in technical and health fields is not just an essential component of professional preparation, but a critical one for ensuring future service security. While theoretical knowledge is necessary, students' practical performance in real laboratory conditions is an objective indicator of their professional competence [1]. In this context, the assessment of practical success cannot be understood without considering the influence of psychological factors, such as stress, which often interfere with performance.

Academic stress is a well-known factor that affects student performance, especially in test or exam situations. This stress is experienced as a result of pressure to succeed, fear of evaluation, exposure to error, and uncertainty in one's abilities [2,3]. According to Hancock & Szalma's model of performance under stress, moderate levels of stress can increase alertness and motivation. However, it is crucial to note that high levels of stress can have a detrimental effect on cognitive processes such as attention, memory, and motor coordination, highlighting the need for stress management strategies [4].

These findings hold particular significance in fields that demand fine motor skills and technical precision, such as dental techniques. For instance, the creation of an orthodontic bracket involves precise twisting of wires and accurate placement on the model. A wealth of research has demonstrated that stress significantly diminishes the quality of performance in tasks that necessitate precise processing and coordinated motor control, as seen in clinical simulations or laboratory assessments [5-7].

Furthermore, the research suggests that stress does not always directly affect the time it takes to complete a task, but rather the quality of execution. Students under stress may work at a normal

pace, but with more errors and deviations from technical [8,9]. This underscores the need for further research to understand the complex relationship between stress and performance, and how it should be analyzed in terms of the quality, time, and self-esteem experienced by students.

Another important dimension is gender as a confounding factor, as previous and recent studies have shown that women often report higher levels of stress but show better performance due to more effective stress coping strategies such as mindfulness, social support, and problem-solving [10-13]. However, these findings are influenced by the nature of the task, the educational context, and other social and cultural factors [14].

In this context, this research aims to assess the relationship between experienced stress, time of completion, and quality of technical work in a practical task – the realization of an orthodontic bracket – by second-year students of the dental technician program at UBT. The study uses highly reliable and standardized tools, such as the Subjective Units of Distress Scale (SUDS) for stress assessment and objective schemes for technical quality assessment, to contribute to the development of integrated approaches to evaluating and improving teaching practices in technical fields.

## Materials and Methods.

### Participants and Setting:

This study, unique in its focus on second-year students from the Dental Technician program at UBT, was conducted during the final practical examination session. The research was held under meticulously controlled laboratory conditions, ensuring the integrity of the results. Only students who met the stringent eligibility requirements for participation in the practical exam were included. Permission to conduct the study was obtained from the respected **Ethics Committee** of the **Department of Dentistry** at UBT, in accordance with the Declaration of Helsinki.

**Inclusion Criteria:**

Participants were included in the study if they:

- Had completed the Orthodontic Appliances I course
- Attended at least 80% of the practical exercises throughout the semester
- Had completed and presented at least one seminar related to orthodontic appliances during the semester

Participants were excluded from the study if they met any of the following conditions:

- Failure to complete the **Orthodontic Appliances I** course
- Attendance of **less than 80%** of the practical sessions during the semester
- Failure to **complete and present the required seminar** during the course
- **Absence from the scheduled practical exam**
- **Refusal to complete** the SUDS scale before or after the task
- **Lack of informed consent** to participate in the research

**Materials:**

The following materials and tools were used during the study:

- Orthodontic stainless-steel wire (diameters: 0.7 mm and 0.4 mm)
- Orthodontic study models (typodonts)
- Randomized labeled tickets containing the names of the clasps and springs
- The Subjective Units of Distress Scale (SUDS) form, used to assess perceived stress levels before and after the practical task.

**Methodology.**

Each student was instructed to randomly draw a ticket indicating the clasp or spring they were required to fabricate. The options included:

- Clasps: Adam's clasp, double Adam's clasp, C clasp, Jackson clasp
- Springs: Z-spring, closed T-spring, open (finger) spring
- All components had been practiced throughout the summer semester.

The fabrication time was measured using a stopwatch, beginning at the start of the task and ending upon its completion. Figures 1 and 2, Students were asked to evaluate their subjective stress level both before and after completing the task, using SUDS, measuring the subjective intensity of disturbance or distress currently experienced by an individual scale, ranging from 0 to 10. Upon completion of each task, the technical quality of the fabricated appliance was assessed by two independent evaluators (the course professor and the teaching assistant), using a standardized evaluation rubric based on the following criteria:

- Accuracy of form
- Stability
- Proper positioning of the work on the model
- Aesthetic quality (Figure 3).

## Results.

**Hypothesis 1: There is a significant relationship between perceived stress and final success in the realization of an orthodontic bracket.**

To test this hypothesis, the correlation between the level of subjective stress measured with the SUDS scale and the final grade achieved by the students was analyzed. Hypothesis 1 was confirmed, showing there was a significant negative relationship between stress and grades. As shown in Table 1, the results showed a significant negative correlation between stress and grade ($r = –0.576$, $p < .001$). This means that as stress increases, the student's grade tends to decrease, which reinforces the assumption that stress directly affects the quality of technical performance.

**Hypothesis 2: Students with lower levels of stress receive higher grades and complete work faster.**

Hypothesis 2 was partially confirmed: Students with lower stress received higher grades, but there was no significant difference in work completion time.

The correlation analysis showed a significant negative relationship between stress and grade, as noted above. However, as seen in Table 2, the relationship between stress and the time to complete the paragraph was not significant ($r = .199$, $p = .184$), suggesting that students with high stress did not necessarily need more time, even though they had lower grades.

The regression analysis showed that the combined predictors, Grade and SUDS, explained a modest portion of the variance in the dependent variable ($R = .292$, $R^2 = .085$, Adjusted $R^2 = .042$). This indicates that only about 8.5% of the variance was

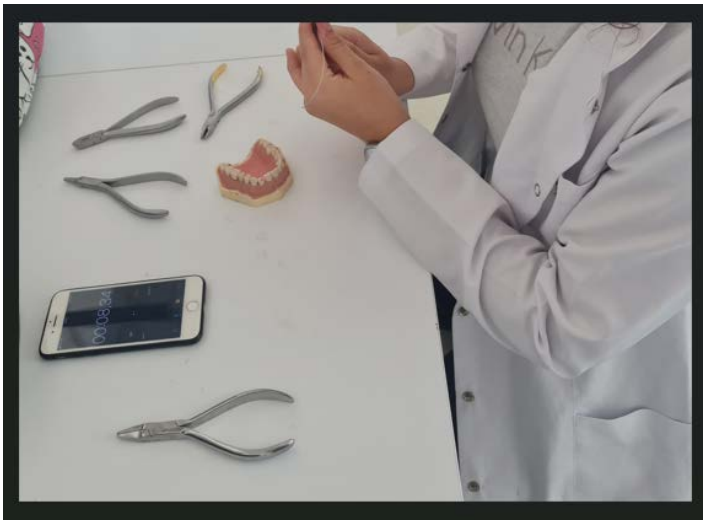

***Figure 1.*** *A female student constructing an orthodontic component during the practical examination.*

***Figure 2.*** *A male student constructing an orthodontic component during the practical examination.*

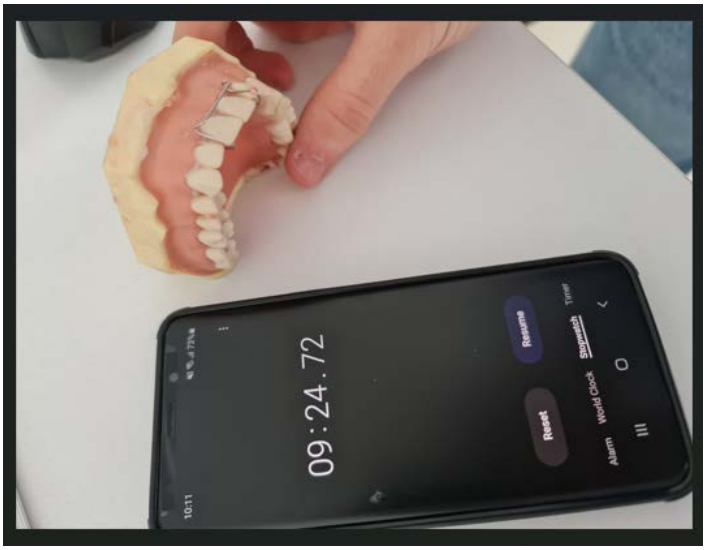


***Figure 3.*** *Measurement of time and assessment of the final work of student constructing an orthodontic clasp during the practical examination.*

***Table 1.*** *Pearson correlation between perceived stress (SUDS) and grade.*

| **Correlations** | | | |
|---|---|---|---|
| | | SUDS | Grade |
| SUDS | Pearson Correlation | 1 | -.576** |
| | Sig. (2-tailed) | | .000 |
| | N | 46 | 46 |
| Grade | Pearson Correlation | -.576** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 46 | 46 |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | |

***Note.*** *N = 46. p < .01 (2-tailed). SUDS = Subjective Units of Distress Scale (perceived stress); Grade = final score on practical task.*

***Table 2.*** *Pearson correlation among perceived stress (SUDS), Grade, and Completion Time (Minutes).*

| **Correlations** | | | | |
|---|---|---|---|---|
| | | SUDS | Grade | Minutes |
| SUDS | Pearson Correlation | 1 | -.576** | .199 |
| | Sig. (2-tailed) | | .000 | .184 |
| | N | 46 | 46 | 46 |
| Grade | Pearson Correlation | -.576** | 1 | -.289 |
| | Sig. (2-tailed) | .000 | | .052 |
| | N | 46 | 46 | 46 |
| Minutes | Pearson Correlation | .199 | -.289 | 1 |
| | Sig. (2-tailed) | .184 | .052 | |
| | N | 46 | 46 | 46 |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | | |

***Note****. N = 46. SUDS = Subjective Units of Distress Scale (perceived stress); Grade = final score on practical task; Minutes = time taken to complete the task.*

***Table 3.*** *Model Summary for Linear Regression Predicting Completion Time (Minutes) from Perceived Stress (SUDS) and Grade.*

| **Model Summary** | | | | |
|---|---|---|---|---|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
| 1 | .292[a] | .085 | .042 | 5.35266 |
| a. Predictors: (Constant), Grade, SUDS | | | | |

***Note.*** *Dependent variable: Completion Time (Minutes). Predictors: Grade and Perceived Stress (SUDS).*

accounted for, with the adjusted value suggesting even weaker explanatory power. The relatively high standard error of estimate (5.35) further reflects substantial deviation between predicted and observed values, underscoring that while Grade and SUDS contribute somewhat, their overall predictive capacity remains limited.

**Hypothesis 3: There are no gender differences in stress levels and success (grade) in completing the crosies.**

Gender differences in grades and perceived stress were examined using descriptive statistics (Table 6) and independent samples t-tests (Table 7). Female students (M = 9.19, SD = 1.13) scored significantly higher on grades than male students (M = 8.10, SD = 1.52), t(44) = -2.80, p = .008, with a mean difference of -1.09 (95% CI [-1.88, -0.31]). In contrast, while male students reported higher perceived stress (M = 3.75, SD = 3.04) compared to females (M = 2.77, SD = 2.64), this difference did not reach statistical significance, t(44) = 1.17, p = .249. Overall, these findings indicate that female students achieved stronger academic performance, whereas the trend of greater perceived stress among males was not statistically supported.

Hypothesis 3 was partially rejected: There was no significant difference in stress, but there was a significant difference in grades, with women performing better.

**Group differences by stress (ANOVA and Tukey HSD):**

Students were divided into three groups according to stress level (low, medium, high), and differences in grades and time were analyzed.

The results from the ANOVA analysis and post-hoc Tukey HSD (Table 4, and Table 8) analysis showed that there were significant differences in grades by stress level ($p < .001$). Students with low stress had higher grades than those with medium and high stress. The most pronounced differences were between the low stress and high stress groups ($d = –2.41$, $p < .001$).

While the ANOVA showed different trends in time by stress level, the differences were not statistically significant ($p > .05$). This suggests that stress does not significantly affect task completion time.

- Students with lower stress received significantly higher grades.
- There were no significant differences in completion time.

**H1: There is a significant negative correlation between stress level and grade — the higher the stress, the lower the grade.**

**H2: There is a significant correlation between stress level, performance evaluation, and time required for clasp fabrication.**

**Hypothesis 2: Linear Regression:**

**H3: There is no significant difference between male and female students in the level of perceived stress and the success in clasp fabrication.**

**ANOVA.**

**Students with lower stress levels achieved higher grades compared to those with higher stress levels.**

## Discussion.

### Stress and academic performance:

The results of the correlation analysis revealed a significant negative relationship between perceived stress and achievement grade ($r = –0.576$, $p < 0.01$). This means that as stress levels rise, academic performance tends to decline. This finding aligns with existing literature that underscores the detrimental effects of high stress on concentration, attention, and decision-making in academic settings [15,16], and that highlights the negative impact of high stress on working memory, attention, decision-making, and performance on complex tasks [4,20]. Similarly, Hancock and Szalma found that while moderate stress can enhance alertness and concentration, high stress levels can lead to cognitive overload and a marked decrease in performance on academic or complex tasks. These findings highlight the importance of managing stress for optimal academic performance. [4].

***Table 4.*** *ANOVA Summary for Regression Predicting Completion Time (Minutes).*

| **ANOVA**[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | 114.454 | 2 | 57.227 | 1.997 | .148[b] |
| | Residual | 1231.990 | 43 | 28.651 | | |
| | Total | 1346.443 | 45 | | | |
| a. Dependent Variable: Minutes | | | | | | |
| b. Predictors: (Constant), Grade, SUDS | | | | | | |

***Note.*** *Dependent variable: Completion Time (Minutes). Predictors: Grade and Perceived Stress (SUDS).*

***Table 5.*** *Coefficients from Regression Predicting Completion Time (Minutes).*

| **Coefficients**[a] | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 16.565 | 6.780 | | 2.443 | .019 |
| | SUDS | .095 | .344 | .049 | .277 | .783 |
| | Grade | -1.011 | .693 | -.260 | -1.459 | .152 |
| a. Dependent Variable: Minutes | | | | | | |

***Note.*** *Dependent variable: Completion Time (Minutes).*

***Table 6.*** *Descriptive Statistics of Grade and Perceived Stress (SUDS) by Gender.*

| **Variable** | **Gender** | **N** | **Mean** | **Standard Deviation** | **Standard Error of the Mean** |
|---|---|---|---|---|---|
| Grade | Male | 20 | 8.10 | 1.52 | 0.34 |
| Grade | Female | 26 | 9.19 | 1.13 | 0.22 |
| SUDS | Male | 20 | 3.75 | 3.04 | 0.68 |
| SUDS | Female | 26 | 2.77 | 2.64 | 0.52 |

***Table 7****. Independent Samples t-Tests for Grade and Perceived Stress (SUDS) by Gender.*

| **Independent Samples Test** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | **Levene's Test for Equality of Variances** | | **t-test for Equality of Means** | | | | | | |
| | | **F** | **Sig.** | **t** | **df** | **Sig. (2-tailed)** | **Mean Difference** | **Std. Error Difference** | **95% Confidence Interval of the Difference** | |
| | | | | | | | | | **Lower** | **Upper** |
| Grade | Equal variances assumed | 2.310 | .136 | -2.797 | 44 | .008 | -1.09231 | .39048 | -1.87926 | -.30535 |
| | Equal variances not assumed. | | | -2.693 | 33.999 | .011 | -1.09231 | .40565 | -1.91669 | -.26792 |
| SUDS | Equal variances assumed | 2.303 | .136 | 1.169 | 44 | .249 | .98077 | .83929 | -.71071 | 2.67224 |
| | Equal variances not assumed. | | | 1.147 | 37.792 | .259 | .98077 | .85507 | -.75054 | 2.71207 |

***Note.*** *CI = Confidence Interval. Results are shown for both equal and unequal variance assumptions based on Levene's Test.*

***Table 8.*** *Tukey HSD Post-Hoc Comparisons for Grade and Completion Time (Minutes) by Stress Group.*

| **Multiple Comparisons** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Tukey HSD** | | | | | | | |
| **Dependent Variable** | **(I) Group** | **(J) Group** | **Mean Difference (I-J)** | **Std. Error** | **Sig.** | **95% Confidence Interval** | |
| | | | | | | **Lower Bound** | **Upper Bound** |
| Grade | 1.00 | 2.00 | .93333 | .42875 | .087 | -.1074 | 1.9741 |
| | | 3.00 | 2.40952* | .47353 | .000 | 1.2601 | 3.5590 |
| | 2.00 | 1.00 | -.93333 | .42875 | .087 | -1.9741 | .1074 |
| | | 3.00 | 1.47619* | .56852 | .034 | .0961 | 2.8562 |
| | 3.00 | 1.00 | -2.40952* | .47353 | .000 | -3.5590 | -1.2601 |
| | | 2.00 | -1.47619* | .56852 | .034 | -2.8562 | -.0961 |
| Minutes | 1.00 | 2.00 | -3.55067 | 2.02961 | .199 | -8.4774 | 1.3761 |
| | | 3.00 | -3.17305 | 2.24157 | .342 | -8.6143 | 2.2682 |
| | 2.00 | 1.00 | 3.55067 | 2.02961 | .199 | -1.3761 | 8.4774 |
| | | 3.00 | .37762 | 2.69123 | .989 | -6.1552 | 6.9104 |
| | 3.00 | 1.00 | 3.17305 | 2.24157 | .342 | -2.2682 | 8.6143 |
| | | 2.00 | -.37762 | 2.69123 | .989 | -6.9104 | 6.1552 |
| *. The mean difference is significant at the 0.05 level. | | | | | | | |

***Note.*** *Group 1 = Low stress; Group 2 = Moderate stress; Group 3 = High stress. CI = Confidence Interval. * $p < .05$.*

Other studies underscore the detrimental effects of test anxiety and academic stress on working memory and cognitive engagement, further emphasizing that the absence of effective coping strategies can exacerbate the negative impact of stress on performance, particularly in assessment situations [5,17-19]. Similarly, Owens et al. demonstrate that chronic stress accumulated over semesters can lead to reduced motivation and overall academic performance. These findings underscore the importance of developing and implementing effective coping strategies to mitigate the adverse effects of stress on academic performance [20].

A new meta-analysis by Pascoe et al. on the impact of perceived stress on undergraduate students showed that stress has significant adverse effects on academic performance and psychological well-being. However, the authors also highlight the empowering fact that stress, if managed through effective coping strategies, can be mitigated. The impact of stress is not only cognitive, but also emotional and motivational, making effective stress management a key to academic success [3].

Another experimental study by Keller et al. found that acute stress induced before cognitive tasks (e.g., math tests) decreases performance by overactivating the sympathetic system, a part of the autonomic nervous system responsible for the 'fight or flight' response, and interfering with information processing. This mechanism is important for understanding why, even in practical tasks, such as making crosswords, stressed students may have difficulty concentrating and fine motor coordination [21].

Recent studies, such as that by Shankar et al., show that academic stress is directly related to performance anxiety and avoidance of assessment tasks, which further worsens the final results. [22]. Similarly, Frazier et al. identified academic stress as one of the strongest predictors of low self-esteem and poor grades. This is especially true in situations where there is no psychological support or a suitable learning environment, underscoring the crucial need for these factors in academic settings [23].

Furthermore, Suh & Hargis, in a study on students in practical and medical programs, emphasize that stress in tasks requiring manual coordination and time pressure affects performance not only through fear of failure, but also through emotional dysregulation. Emotional dysregulation, a term used to describe the inability to manage and respond to emotional experiences effectively, may explain the negative results in this research [7].

**Stress and completion time:**

Contrary to our expectations, we found no significant relationship between the level of perceived stress (SUDS) and the time required to complete the practical task ($r = .199$, $p = .184$), suggesting that stress does not affect the time to complete the task, although it negatively affects its quality (grade). These findings align with Misra and Castillo, who suggest that high stress may lead to more errors, but not necessarily to longer task completion time [2], and is consistent with some contemporary research suggesting that stress does not necessarily affect the speed of task completion, but rather affects the accuracy, quality, and errors made during execution In particular, in practical or manual tasks that require concentration and coordination, individuals may continue to work at a normal pace but make more errors as a result of stress interfering with executive processes and motor control [6,24].

As per a study by Doolan, Bryant, and Moore that analyzed the performance of students in a practical simulation under stress, the total time to complete the task did not change significantly, but the number of errors increased, and the quality of work decreased. The authors underline that stress tends to affect selectively: more on qualitative performance than on time [6].

Similarly, Kellogg et al. in an experiment on performance under testing conditions, found that stressed students often do not work slower. However, their focus decreases, which leads to hasty efforts, not necessarily longer in time, but less controlled and more unstable. This explains why the students in this study, although with high levels of stress, did not spend significantly more time on completing the tasks, but received lower grades [8].

Meanwhile, Ali et al. found that the impact of stress on task duration is heavily influenced by the type of task and the coping strategies employed. On tasks with clear structures, stressed individuals can maintain a similar pace. In contrast, on tasks that require creativity or have open-ended parameters, they often take longer due to the need for doubt and re-corrections. This underscores the importance of understanding the task type in determining the impact of stress on task duration, and enhancing their knowledge in this area [1].

Another crucial element is the perception of time pressure, which can induce stress and influence the pace of work. However, as Mills et al. highlight, if individuals do not view the task as 'urgent' or do not have a specific time limit, stress does not necessarily lead to an increase in execution time. This finding offers reassurance that stress does not always equate to a longer task duration, potentially alleviating some anxiety about stress and task performance [25].

**Gender differences in stress and performance:**

The results of this study showed that there was no significant difference in the level of stress experienced by females and males. However, a significant difference was observed in performance, with females having significantly higher grades compared to males ($p = .008$). These findings are consistent with contemporary literature suggesting that although females often report higher levels of stress, they may perform better academically due to more effective coping strategies and higher motivation to succeed. This implies that understanding and addressing gender-specific stress coping strategies could be a key factor in improving academic performance [26,27].

A study by Santarnecchi et al., which used neuroimaging techniques to investigate brain structures involved in emotional regulation, showed that these structures may contribute to how the sexes respond to academic pressures, making it more likely for women to maintain focus in stressful situations [28]. Similarly, a study by Nolen-Hoeksema and Watkins shows that women are more likely to experience stress both emotionally and cognitively, but are more likely to use active strategies to manage stress (such as planning and seeking support), compared to the avoidance strategies more commonly used by men [11].

Also, Shraim et al.'s study of undergraduate students in STEM and medical fields found that although females reported higher sensitivity to exam stress, they had higher academic scores than males, suggesting a discrepancy between the subjective experience of stress and its impact on performance. However, it is important to note that this study was limited to a specific academic field and may not be generalizable to other disciplines [13].

Meanwhile, Lee et al. argue that gender differences in performance are not only a result of stress but are also influenced by social factors, such as cultural expectations of gender, the way instructors treat students, and the teaching environment. These dynamics can amplify or dampen the impact of stress on academic performance by gender [29].

In line with these findings, Papageorgiou et al. suggest that gender differences in stress and performance should not be treated uniformly, but rather analyzed in the context of the field of study, the type of task, and the level of psychological support available [30].

**Group differences by stress:**

Results from the ANOVA analysis, a statistical test used to compare the means of more than two groups, and post-hoc analysis (Tukey HSD), a method for identifying which specific groups differ from each other, showed that students with low stress had significantly higher grades than those with high stress ($p < .001$). However, no significant differences were found in task completion time between stress groups. This reinforces the impact of high stress in reducing practical performance and confirms the importance of stress management in emotionally charged academic situations [31].

These findings align with numerous contemporary studies, highlighting the significant impact of stress on academic performance, particularly on tasks that demand concentration, memory, and transparent decision-making. As Arsenio and Loria point out, students with high stress often experience declines in executive control and efficiency in information processing, leading to poorer performance on assessment tasks [32].

Ahmed et al. found that students with high stress not only had lower grades but also had poorer motivation, lower academic self-esteem, and higher levels of mental fatigue, making them less prepared to cope with practical or theoretical demands in educational settings [33].

In another study, Chung et al. categorized students according to stress levels. They found that high academic performance was found mainly among students with low to moderate stress, while the high-stress group had not only lower grades, but also more reports of psychosomatic symptoms, which are physical symptoms that are caused or exacerbated by psychological factors, and concentration problems [34].

According to Liu & Chen, prolonged high stress can cumulatively affect academic performance through cognitive overload, emotional exhaustion, and reduced self-regulation capacity. However, students with low stress are better equipped to use mindful coping strategies, such as planning, organizing, and focusing attention, which can significantly improve their performance [35].

On the other hand, stress level did not result in a differentiating factor in the time to complete the task. This finding was also confirmed in the study by Rajabi et al., where students with high stress did not take longer to complete the tasks, but had more errors and deviations from the required standards [9].

These data suggest that the impact of stress is more evident in the quality of performance than in terms of time, and that differentiating students according to stress level is critical for identifying the needs for supportive interventions in academic and practical settings.

## Conclusion.

This study, which aimed to examine the impact of stress during a practical exam on the technical performance of students in the dental technician program at UBT, has produced findings of significant importance. By measuring completion time and work quality through a standardized assessment, we have uncovered a crucial relationship. The statistical analysis revealed a significant negative correlation between stress level and final grade in the realization of orthodontic clasps or springs. Students who experienced less stress received significantly

higher grades, aligning with existing literature that underscores the inhibitory impact of stress on tasks requiring precise motor coordination and high cognitive concentration.

On the other hand, no statistically significant relationship was identified between stress level and task completion time, suggesting that while stress may affect the quality of work, it does not prevent the student from completing the work in a similar time to colleagues with less stress. This reinforces the idea that practical performance should not be assessed solely through duration, but also through the quality and accuracy of the work performed.

The study also addressed gender differences in stress and performance. Although no significant differences were found in the level of reported stress between the sexes, women achieved significantly higher scores on the technical assessment of the work. This result can be interpreted in light of existing research suggesting that women tend to use more effective strategies for coping with stress, such as planning, emotional self-regulation, and seeking support, which may have positively influenced their results.

The findings of the study have important implications for educational practice in the field of dental technology and in general for professional programs that include practical assessment. First, it is recommended that stress management components and training for coping with pressure be included as an integral part of the curriculum to increase not only the technical competence but also the psychological resilience of students. This could be achieved through workshops, counseling services, or incorporating stress management techniques into the regular curriculum. Second, the process of assessing students should be holistic, considering not only external outcomes (grades or time) but also internal factors that influence these outcomes. This could involve the use of self-assessment tools, regular feedback sessions, or the inclusion of stress management as a criterion in the assessment rubric.

In conclusion, this study reinforces the understanding that students' technical performance is not only a reflection of their professional ability but also of their emotional state and capacity to manage stress in assessment situations. This requires an integrated and interdisciplinary approach to teaching and assessment design, to enable the full development of students' capacities in the professional field. However, further research is needed to explore the most effective strategies for managing stress in assessment situations and to understand the long-term effects of stress on students' professional development.

## Limitations.

This study is not without limitations. First, the sample was drawn exclusively from a single educational institution (UBT), which constrains the generalizability of the findings to other academic contexts and populations. Second, the sample size was relatively small (N = 46), comprising only two cohorts of students who met specific eligibility requirements, including the successful completion of the Orthodontic Appliances I examination. This selective inclusion further narrows the representativeness of the data. Third, stress was assessed solely through the self-reported Subjective Units of Distress Scale (SUDS). Although widely used, reliance on a single subjective measure limits the objectivity of stress assessment. Future research would benefit from incorporating physiological indicators, such as heart rate variability or cortisol levels, to triangulate self-report data and provide a more robust evaluation.

Despite these constraints, the study offers preliminary insights and underscores the need for further investigation with larger, more diverse samples and multimethod approaches to stress measurement.

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UBT students.

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