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Depression, anger, and coping strategies among students in Polish medical faculties

Depresja, złość i sposoby radzenia sobie ze stresem u studentów kierunku lekarskiego w Polsce

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Abstract

Introduction and objective: Students are a group particularly exposed to psychological stress. In this study, we aimed to determine the prevalence of depression and anger issues among students and establish the protective value of coping strategies – specifically, whether they can reduce the level of perceived stress. **Materials and methods:** A cross-sectional study was conducted among students of Polish medical faculties using an online questionnaire. The risk of depression was assessed using the validated Beck Depression Inventory (BDI), anger was measured with the State-Trait Anger Expression Inventory (STAXI), and coping strategies were evaluated with the Coping Orientation to Problems Experienced Inventory (Brief-COPE). **Results:** The study included 329 participants. The average BDI score equalled 13.84, with higher levels among females. A total of 165 students (49.6%) had a score above the threshold for an increased risk of depression, while 32 (9.63%) met the criteria for severe symptoms. In case of anger, the mean STAXI score was 24.89. There was a statistically significant correlation between STAXI and BDI scores. In terms of coping mechanisms, a clear advantage of approach strategies was observed (65.36%). In multiple regression analyses, coping strategies did not influence either STAXI or BDI outcomes. **Conclusions:** The high level of depression among the surveyed students is noteworthy, with over 50% scoring above the cut-off point for an increased risk of a depressive episode. The advantage of approach strategies is also interesting, especially in terms of planning strategies and positive reframing. Unfortunately, in the analysed population, coping strategies did not constitute a significant protective factor in relation to the studied conditions.

Keywords: depression, students, anger, coping strategies, medicine

Streszczenie

Wprowadzenie i cel: Stres związany z wysokim wymiarem pracy własnej, duża ilość materiału do przyswojenia w krótkim czasie i presja rówieśnicza to ważne czynniki przekładające się na stan zdrowia psychicznego studentów kierunku lekarskiego. Prowadzą one do wypalenia, a nawet rozwoju chorób psychicznych, między innymi zaburzeń depresyjnych. Sposoby radzenia sobie ze stresem odgrywają dużą rolę w modyfikowaniu ryzyka rozwoju poważniejszych powikłań. Celem badania było określenie znaczenia strategii obronnych przed doświadczanym przez studentów stresem i porównanie ich skuteczności, a także ocena nasilenia objawów zaburzeń depresyjnych i złości jako konsekwencji stresu za pomocą odpowiednich kwestionariuszy. **Materiał i metody:** Badanie przekrojowe zostało przeprowadzone wśród studentów kierunku lekarskiego przy użyciu kwestionariusza online. Do oceny ryzyka zaburzeń depresyjnych użyto Inwentarza Depresji Becka (Beck Depression Inventory, BDI), złości – State-Trait Anger Expression Inventory (STAXI), a strategie radzenia sobie ze stresem były badane za pomocą Inwentarza do Pomiaru Radzenia Sobie ze Stresem Mini-COPE (Coping Orientation to Problems Experienced Inventory, Brief-COPE). **Wyniki:** W badaniu wzięło udział 329 uczestników. Większość stanowiły kobiety

(71,4%), a średni wiek wyniósł 22,46 roku. Nie odnotowano statystycznie znaczącej różnicy w wieku pomiędzy płciami. Średni wynik w BDI wynosił 13,84 i był wyższy u kobiet. 165 (49,6%) studentów przekroczyło próg odcięcia umiarkowanej depresji, a 32 (9,63%) – ciężkiej. W przypadku złości średni wynik STAXI wynosił 24,89. Nie stwierdzono statystycznie znaczącej korelacji między STAXI a BDI. W przypadku strategii radzenia sobie ze stresem częściej wybierane były metody konfrontacyjne (65,36%), ale żadne nie wykazały wpływu na BDI i STAXI w analizie wielokrotnej regresji. **Wnioski:** Na uwagę zasługuje fakt, że ponad 50% uczestników przekroczyło punkt odcięcia dla zwiększonego ryzyka depresji. Do najczęściej wybieranych metod konfrontacyjnych należały planowanie i pozytywne definiowanie, jednak żadna ze strategii nie miała ochronnego wpływu na emocje odczuwane przez studentów.

Słowa kluczowe: depresja, studenci, gniew, strategie radzenia sobie, kierunek lekarski

INTRODUCTION

Psychological stress is a sense of threat resulting from a subjective feeling of inadequacy of the resources possessed by an individual to the requirements of a given task. This leads to frustration, which may have either a mobilising or depressing effect, depending on the person's mental state. The physiological reaction of the body in an emergency situation leads to changes in the nervous and endocrine systems, e.g. through an increase in the secretion of cortisol and adrenaline. Persistently high cortisol levels lead to numerous disorders, including heightened anger, dysfunctions in the musculoskeletal system, digestive and cardiovascular systems, such as an increase in the incidence of gastric and duodenal ulcers, as well as osteoporosis (Brzozowski, 2019; Moons et al., 2010; Silverthorn, 2018; Zahorska-Markiewicz et al., 2017). They can also lead to the development of mental health disorders, including depression (Brzozowski, 2019; Silverthorn, 2018; Zahorska-Markiewicz et al., 2017). In response to experienced stress, psychological defence mechanisms develop. Their nature varies between individuals, but they can generally be divided into confrontational and avoidant. Students are a group particularly exposed to psychological stress, primarily due to the changes associated with the transition from secondary school to university. The change in teaching methods, a broader scope of independent work, and a reorganisation of daily life, often resulting from relocation and becoming independent, can significantly impact the mental health of students. This period is also associated with the loss of existing peer relationships and exposure to a completely new social group, in which establishing new connections becomes necessary. The transitional period between adolescence and adulthood is also linked to career planning and starting a family, both of which can be stress-inducing. Medical studies serve as a particularly illustrative example of this phenomenon due to the environmental pressures associated with academic performance and the volume and diversity of material to be mastered (Rotenstein et al., 2016). According to a 2016 meta-analysis investigating the prevalence of depressive symptoms among medical students, 27.2% of the 116,628 participants from 15 countries, surveyed between 1982 and 2015, exhibited depression or related symptoms. Of those, only 15.7% sought psychiatric help (Ross et al., 1999).

Polish data similarly indicate that the prevalence of depression among medical students ranges from 14% to even 28.8%, with the majority unwilling to seek the help of a specialist (Adamiak et al., 2004; Marek et al., 2005).

Mental health among medical students is a crucial issue; however, in Poland, there is a limited number of studies addressing this problem, particularly regarding the consequences of stress and the use of defence mechanisms. Only a few reports have emerged in recent years, highlighting the need for updated data on this subject. Understanding these phenomena would allow for the development of strategies that could more effectively prevent the negative health effects of psychological stress. This could also contribute to reducing the risk of burnout – a real concern, given that as many as 61.1% of medical students have negative feelings about their studies, and over 42% describe their daily life as gloomy and difficult (Pieniawska et al., 2017). It is noteworthy that students rarely seek help to address their emotional or psychological problems. A study conducted in the United States among 873 medical students found that only 43.4% had sought help in the past 12 months, while among those presenting burnout symptoms, the figure was 33.9% (Dyrbye et al., 2015).

However, the existing research does not allow for determining potential solutions to the above problems. One area with potential is the examination of stress coping strategies.

The first objective of this study was to determine the subjective intensity of depressive and anger symptoms among medical students at the Medical University of Silesia. The second objective was to compare the effectiveness of various stress coping strategies in reducing these symptoms.

MATERIALS AND METHODS

The survey was conducted during the 2021/2022 academic year using a set of questionnaires prepared in Google Forms. The forms were distributed to respondents via social media, in closed, moderated groups to which only medical students had access (on the Facebook.com platform). All respondents gave informed consent to participate in the study. Without it, they were unable to complete the survey.

Questionnaires

The entire study was based on three questionnaires and three additional questions prepared by the authors. The questionnaires included:

1. anger questionnaire – State-Trait Anger Expression Inventory 2 (STAXI-2);
2. Beck Depression Inventory (BDI);
3. Coping Orientation to Problems Experienced Inventory (Brief-COPE).

The authorial questions concerned the following issues:

“Assess how the following statements apply to you:

1. I feel overwhelmed by the number of responsibilities.
2. Medical studies give me great satisfaction.
3. If I could go back in time, I would choose medical studies again, knowing what I know now”.

The questions had five possible answers: “I don’t know”, “definitely not”, “rather not”, “rather yes”, and “definitely yes”.

The tool used to measure the state, expression, and control of anger was the first part of the STAXI-2 questionnaire (Spielbergen et al., 1999). The full instrument comprises 57 questions divided into three parts. The first two are used to study the experience of anger as a state and as a trait, respectively. The third part, on the other hand, is used to determine the expression and control of anger with reference to aggressive behaviour. A detailed description of the subscales can be found in the article presenting the Polish validation of the questionnaire conducted by Waław Bąk (Bąk, 2016).

The psychometric properties of the Polish version of the questionnaire were checked in four studies involving 625 individuals aged 17–30, 90% of whom were students. The coefficient of internal consistency (Cronbach’s α) for the first part was 0.95 (Bąk, 2016).

The second questionnaire used was Brief-COPE. It is a tool designed to explore a wide range of methods for coping with stressful events in life. The methods are divided into adaptive (approach) and avoidant. The individual categories assessed by the questionnaire are: self-distraction, active coping, denial, substance use, emotional support, use of information, behavioural disengagement, venting, positive reframing, planning, humour, acceptance, religion, and self-blame (Carver, 1997). The Polish version of the questionnaire was validated in a group of 200 participants aged 25–60 years (Guttman $\lambda = 0.87$) (Juczyński and Ogińska-Bulik, 2009).

The third questionnaire used in the study was the BDI. It is a widely used screening tool comprising 21 questions about the subjective assessment of one’s own well-being and other symptoms commonly associated with the clinical picture of depression. When interpreting the results of the BDI scale, the following scores are generally accepted: 0–10 points – no depression or mood disturbance; 11–27 – moderate depression; ≥ 28 – severe depression. The questionnaire was translated and validated by Parnowski and Jernajczyk (1997).

Statistical analysis

Statistical analysis was performed using PQ Stat and Statistica v. 13.0 software. The adopted level of statistical significance was $\alpha = 0.05$. The results are presented as means with 95% confidence intervals. As part of the statistical analysis, due to the failure to meet the assumption of normality of distribution of the analysed variables, mainly non-parametric methods were used – the Mann–Whitney U test for comparisons of two independent quantitative variables, the Wilcoxon test for multiple variables, and Spearman’s rank test for correlation analyses. For qualitative variables, the χ^2 test was used. All results are reported with an indication of whether the p -value was lower than the assumed significance level.

Characteristics of the study group

General analysis

The study involved 329 students, including 235 women (71.4%) and 94 men (28.5%). All the respondents were medical students at the Medical University of Silesia, which was a criterion for inclusion in the study group. The median age was 22.46 years (95% CI: 22.46–23.02). A total of 223 (67.78%) respondents declared full dependence on their family for maintenance, 93 (28.26%) were partially dependent, and 13 (3.95%) reported financial independence. The largest group of respondents, 111 (33.7%), lived with a roommate, 100 (30.9%) with their family. Additionally, 51 (15.5%) lived with their partner and 47 (14.2%) lived alone.

RESULTS

The average Beck score among the respondents was 13.84 (95% CI: 12.84–14.84); in the female group, it was 14.61 (95% CI: 13.44–15.78), and in the male group, it was 12 (95% CI: 10.09–13.90). According to the guidelines for the interpretation of the Beck scale, the cut-off point for moderate depression was exceeded by 165 students (49.6%), and for severe depression by 32 students (9.63%). Distributions by gender are presented in Tab. 1, while the number of students by year of study is shown in Fig. 1. Due to the small number of individuals who checked the option “I prefer to self-describe”, it was decided to exclude these respondents from further analysis in order to maintain statistical validity and avoid the risk of introducing error.

In terms of the STAXI anger scale, the average score among the respondents was 24.89 (95% CI: 22.63–27.15), with no differences between the sexes observed in the Mann–Whitney U test ($p = 0.55$).

In the Spearman’s rank correlation analysis, the result of the STAXI questionnaire was moderately correlated with the result on the Beck scale ($r = 0.3$; $p < 0.05$), which is presented in Fig. 2. The age of the respondents did not significantly correlate with the results of either scale.

Sex	Below the cut-off	Moderate depression	Severe depression
Female	88 (37.45%)	124 (52.77%)	23 (9.79%)
Male	45 (47.87%)	40 (42.55%)	9 (9.57%)
Whole population	2	1	0

Tab. 1. Distribution of Beck scale scores by gender. The observed differences in score distribution were not statistically significant in the χ^2 test

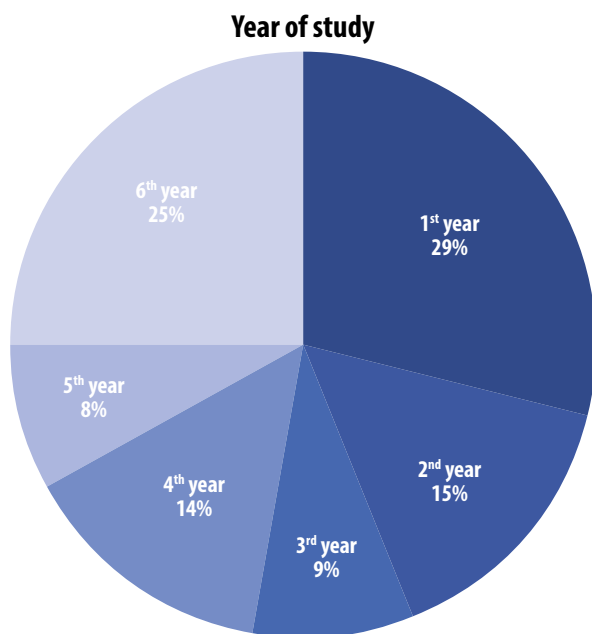


Fig. 1. Percentages of students by year of study

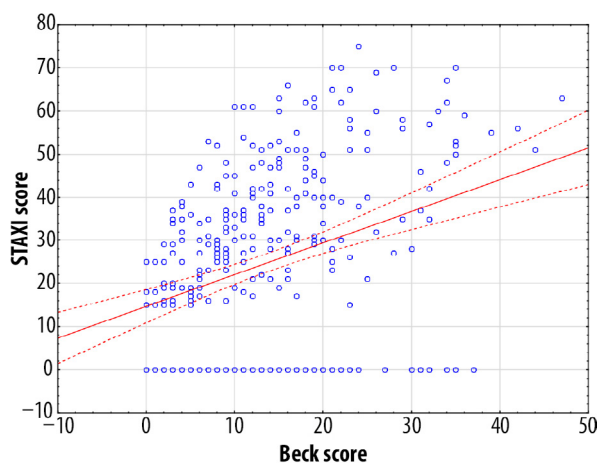


Fig. 2. Spearman's rank correlation between the STAXI and Beck scale scores

In the analysis of the results of the Beck and STAXI questionnaires, the results between subsequent years of study were also compared by means of multiple comparisons. No statistically significant difference was observed for the Beck scale. However, STAXI scores were significantly higher in year 3 ($p = 0.002$) and year 5 ($p = 0.02$). The results of these analyses are presented in Fig. 3.

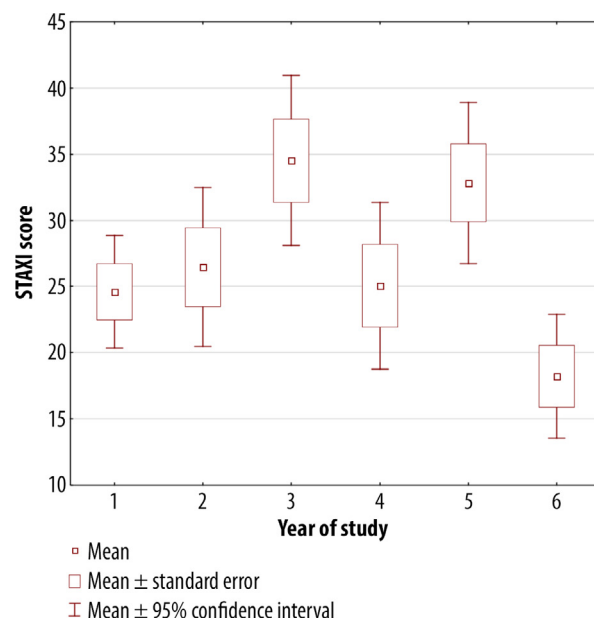


Fig. 3. Multiple comparisons of the level of anger measured by the STAXI scale between consecutive years of medical studies

Approach	Score (95% CI)	Avoidant	Score (95% CI)
Active coping	5.92 (5.7–6.14)	Self-distraction	5.80 (5.66–5.99)
Emotional support	5.66 (5.45–5.88)	Denial	5.11 (4.97–5.26)
Use of informational support	5.56 (5.35–5.78)	Substance use	4.94 (4.79–5.09)
Positive reframing	6.08 (5.9–6.26)	Behavioural disengagement	5.43 (5.29–5.58)
Planning	5.99 (5.7–6.22)	Venting	5.76 (5.58–5.95)
Acceptance	6.09 (5.87–6.32)	Self-blame	5.57 (5.35–5.79)
Overall	35.34 (34.54–36.14)	Overall	32.64 (32.09–33.20)

Tab. 2. Analysis of methods of coping with stress surveyed by the COPE questionnaire

The results of the analysis of coping strategies (COPE) are presented in Tab. 2. Students scored highest on the scales of positive redefinition and acceptance, and lowest on the substance abuse scale. In the analysis, a statistically significant predominance of confrontational strategies was observed among medical students (Wilcoxon pair test with $p < 0.05$). The predominance of confrontational strategies was observed in 217 students (65.36%) and avoidance strategies in 99 (29.81%). A total of 16 (4.81%) students presented a balance between both types of strategies. The predominance of either confrontation or avoidance strategies did not significantly affect the mean scores on the Beck and STAXI scales. In the analysis of differences in strategy use between sexes, it was observed that men were significantly more likely to resort to substance use, while women to seek emotional support from others, and denial. For the remaining strategies, the distribution of response rates was similar in both sexes.

	β	Standard error of β	t	p
Free expression	9.92	2.68	3.69	<0.0001
Behavioural disengagement	1.79	0.36	4.96	<0.0001
Positive reframing	-0.63	0.28	-2.19	0.02
Planning	0.77	0.24	3.22	0.001
Self-blame	-1.18	0.23	-5.15	<0.00001

Tab. 3. Multiple regression model parameters for the relationship between the Beck depression scale and coping strategies assessed by the COPE questionnaire

	β	Standard error of β	t	p
Free expression	25.40	5.51	4.60	<0.0001
Denial	2.41	0.85	2.82	<0.001
Venting	-2.23	0.66	-3.35	<0.001

Tab. 4. Multiple regression model parameters for the relationship between the Beck depression scale and coping strategies assessed by the COPE questionnaire

A multiple regression analysis was also conducted to examine the influence of individual coping strategies (independent variables/regressors) on the Beck and STAXI scores (dependent variables). The model was constructed using the backward stepwise method.

The first model explored the relationship between coping strategies and the Beck score. The obtained value of the regression coefficient was $R^2 = 0.17$ at $p < 0.05$. The value of the F test was statistically significant ($p < 0.0001$), which confirms the global statistical significance of the model. The strategies of withdrawal, positive redefinition, planning and self-blame were included in the model. Detailed parameters are presented in Tab. 3.

The second model examined the relationship between coping strategies and the STAXI score. The value of the regression coefficient was $R^2 = 0.04$ at $p < 0.05$. The F test value was statistically significant ($p < 0.0001$), which confirms the global statistical significance of the model. The strategies of denial and retaliation were incorporated into the model. Detailed parameters are presented in Tab. 4.

To assess the collinearity of the independent variables, the variance inflation factor (VIF) was calculated, yielding scores below 10, indicating that the existing collinearity does not interfere with the model analysis.

An analysis of responses to the authors' original questions was also performed. The structure of the answers to these questions is presented in Tabs. 5 A–C. The observed differences in the structure of responses between men and women were statistically significant in the χ^2 test.

An analysis of the relationship between the responses to the above-mentioned questions and the results of the STAXI questionnaires and the Beck scale was also carried out. For the Beck scale, responses to all three questions had a statistically significant effect on the average scores. In the case of the STAXI scale, only the response to the question

I feel overwhelmed by the number of responsibilities	n (%)	n of men (%)	n of women (%)
Definitely not	9 (2.71%)	5 (5.32%)	4 (1.70%)
Rather not	68 (20.48%)	23 (24.47%)	44 (18.72%)
I don't know	27 (8.13%)	10 (10.60%)	16 (6.81%)
Rather yes	124 (37.30%)	32 (34.04%)	91 (38.72%)
Definitely yes	104 (31.30%)	24 (25.53%)	80 (34.04%)

Tab. 5 A. Distribution of responses to the statement "I feel overwhelmed by the number of responsibilities" in the surveyed population. "Percentage" refers to the share of respondents in each column category

Medical studies give me great satisfaction	n (%)	n of men (%)	n of women (%)
Definitely not	33 (9.9%)	15 (15.96%)	17 (7.23%)
Rather not	58 (17.46%)	19 (20.21%)	39 (16.6%)
I don't know	48 (14.45%)	14 (14.89%)	34 (14.47%)
Rather yes	123 (37.04%)	31 (32.98%)	91 (38.72%)
Definitely yes	70 (21.08%)	15 (15.96%)	54 (22.98%)

Tab. 5 B. Distribution of responses to the statement "Medical studies give me great satisfaction" in the surveyed population. "Percentage" refers to the share of respondents in each column category

If I could go back in time, then with an up-to-date insight, I would choose medical studies again	n (%)	n of men (%)	n of women (%)
Definitely not	26 (7.83%)	10 (10.64%)	15 (6.38%)
Rather not	43 (12.95%)	14 (14.89%)	29 (12.34%)
I don't know	47 (14.15%)	14 (14.89%)	33 (14.04%)
Rather yes	82 (24.69%)	27 (28.72%)	54 (22.98%)
Definitely yes	134 (40.36%)	29 (30.85%)	104 (44.26%)

Tab. 5 C. Distribution of responses to the statement "If I could go back in time, then with an up-to-date insight, I would choose medical studies again" in the studied population. "Percentage" refers to the share of respondents in each column category

about the feeling of being overwhelmed had a significant impact, while the other two questions did not show a statistically significant relationship with the average score ($p = 0.37$ for question No. 2 and $p = 0.8$ for question No. 3). Statistically significant results are presented in Figs. 4 A–6. Fig. 7 illustrates the distribution of responses to the statement "I feel overwhelmed by the number of responsibilities" depending on the year of study.

DISCUSSION

The medical field is considered demanding, and feeling overwhelmed by the demands of self-directed work for those studying is common, and was reported by almost 70% of respondents in the current survey. Women described themselves this way more often (72%) compared to men (56%). First- and third-year students felt the most

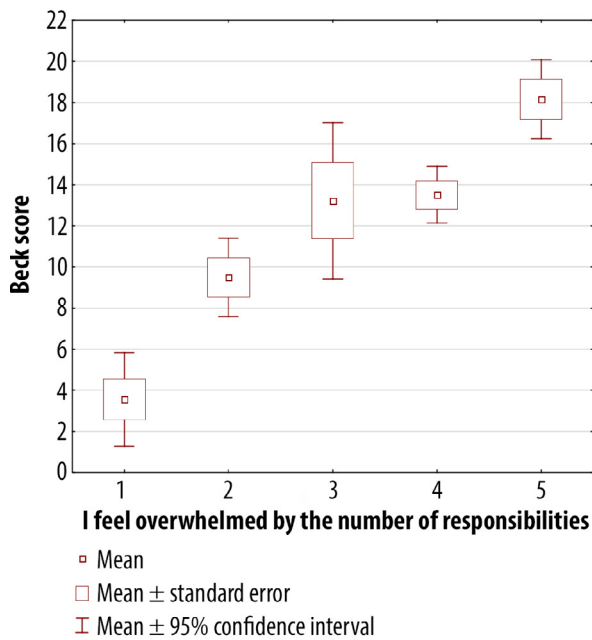


Fig. 4 A. Differences in Beck scale scores depending on the response to the statement "I feel overwhelmed by the number of responsibilities". ANOVA test, $p < 0.0001$

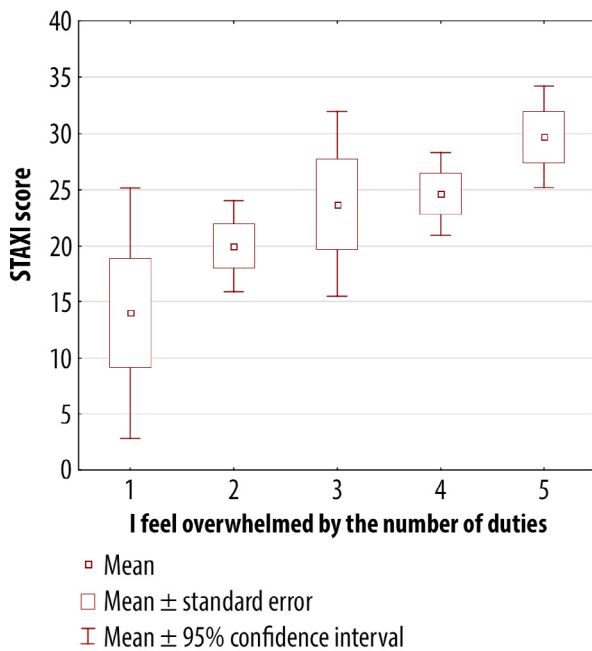


Fig. 4 B. Differences in the STAXI scale scores depending on the response to the statement "I feel overwhelmed by the number of duties". ANOVA test, $p = 0.01$

overwhelmed. According to international studies, for those entering medical school, the main sources of stress are related to the university and include the broad range of material to be learned, frequent midterms, and competition with peers. In contrast, Polish students cited oral exams, failing to achieve a passing grade, and having to express their opinions in front of others (Brożyna et al., 2018; Rani et al., 2016; Satpathy et al., 2021). In a study conducted in Poland among

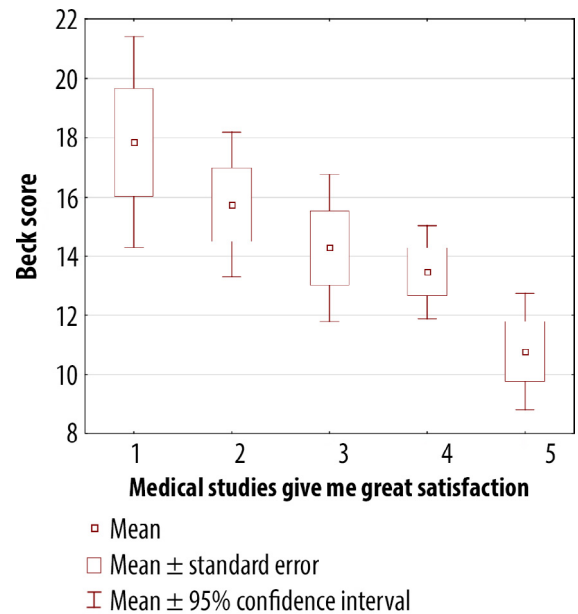


Fig. 5. Differences in Beck scale scores depending on the response to the statement "Medical studies give me great satisfaction". ANOVA test, $p = 0.017$

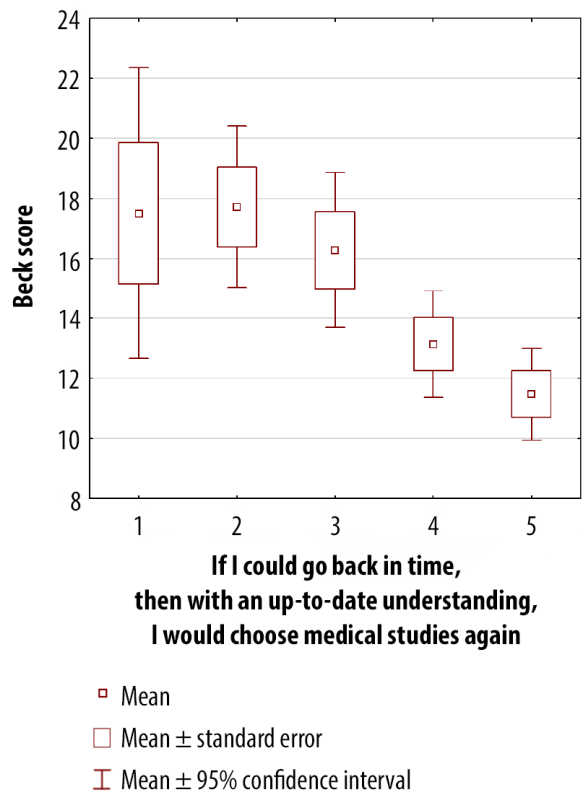


Fig. 6. Differences in Beck scale scores depending on the response to the statement "If I could go back in time, then with an up-to-date understanding, I would choose medical studies again". ANOVA test, $p < 0.001$

264 first-year medical students in Kraków, Poland, the mean score on the Perceived Stress Scale (PSS-10), which measures perceived stress, was 20.97 ± 7.18 , compared to 14.2 ± 6.2

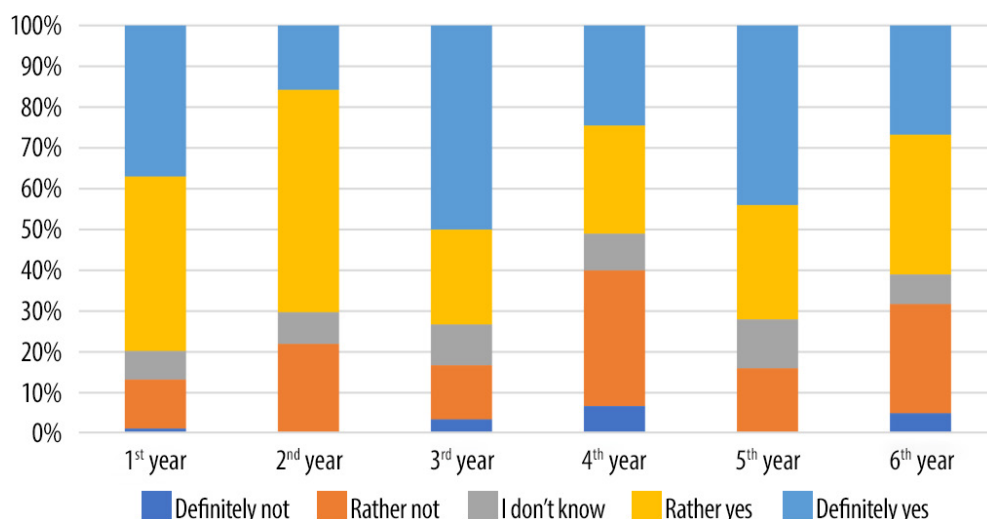


Fig. 7. Distribution of responses to the statement "I feel overwhelmed by the number of responsibilities" depending on the year of study

in the general population in the 18–29 age range (Cohen and Williamson, 1988; Cohen et al., 1983; Marchewka et al., 2023).

The reason for the overwhelm among third-year students may be due to the start of clinical classes, which are minimal in earlier years. The first contact with patients and the need to combine practical skills with theoretical knowledge can be challenging. Similar observations were made among 526 students from other medical faculties in Kraków during their first clinical classes, where almost half experienced high levels of stress according to the PSS-10 (Bodys-Cupak et al., 2019). Interestingly, the respondents were also more likely to use confrontational coping strategies to deal with stress, with active management and planning predominating.

An important aspect of the present study is the time it took to return to full-time classes after the COVID-19 pandemic, during which stress, anxiety disorders, and depression were more prevalent among students than before (Wu et al., 2023).

Despite feeling overwhelmed, the majority of students expressed satisfaction with their chosen field of study, and about 65% of them would choose a medical career again, knowing what they know now.

Symptoms of moderate depressive disorder, as measured by BDI scores, were almost 20% more common in women than in men, while severe severity was comparable between the sexes. The gap in the prevalence of the aforementioned symptoms among female and male medical majors is noteworthy, as it is lower than in the general population, where depressive disorders are more than 2.5 times more common in women (NFZ o zdrowiu – Depresja. Dane za lata 2013–2021). In a 2016 meta-analysis involving 62,728 medical students, depressive disorders were more common in women (31.5%), compared to men (24.2%) (Puthran et al., 2016). In addition, it is important to remember that data from the Polish National Health Fund are based on services with a principal or comorbid diagnosis, while the Beck scale used in this study is designed for screening purposes.

In a 2015 survey of medical students from Poland, Portugal, and Germany, where the BDI was also used to determine the risk of depressive disorders, Poland had the highest percentage of high scores. More than half of the students from the Medical University of Silesia and the Silesian University of Technology in Gliwice scored over 10 points on the Beck scale, exceeding the norm. In Germany and Portugal, it was 43.82% and 37.57%, respectively (Seweryn et al., 2015). According to another study, a high risk of depression and anxiety disorders also applies to foreign students studying medicine in Poland (Jaroszewska et al., 2020). The higher scores recorded in Poland may indicate that, in addition to the difficulties that are also present in other countries, such as a heavy academic workload, contact with patients and high demands, there are also problems that occur exclusively or in greater intensity in Poland. This may relate to the educational system, as the university is usually cited as the main source of stress for students. However, this hypothesis requires further research to could clarify this disparity (Brożyna et al., 2018; Cohen et al., 1983; Satpathy et al., 2021). Regardless of the cause, this indicates a strong need for appropriate methods to combat perceived stress – both through individual coping strategies and appropriate psychological help.

The severity of anger among the surveyed students was definitely elevated, compared to the general population. Interestingly, the results of the STAXI survey did not show gender-based differences. They were also not significantly related to the age of the respondents, but showed differences between successive years of study. Students in the third and fifth years of medical studies presented higher intensity of anger as a trait, while sixth-year students scored the lowest. This may be due to several reasons, including the characteristics of a given year of study – each year has different classes, and instructors and exercise leaders change, which may make a given year subjectively perceived as more difficult. When starting their studies, not every student has the right idea about the work of a medical practitioner. These

misconceptions can affect the occurrence of difficulties in establishing relationships with patients, and these problems can result in an increasing sense of frustration (Park and Hong, 2022). With the following years, such awareness can be a reason for future doctors to doubt, lack motivation and desire to act. In addition, higher levels of anger may have been influenced by the lasting effects of the pandemic, during which they felt more stress than before (Moons et al., 2010; Park and Hong, 2022; Rogowska et al., 2020).

In terms of the interaction between the scales analysed, the score of the STAXI subscale used showed a moderate correlation with BDI scores, that is, as the level of frustration and anger increased, the severity of subjectively assessed depressive symptoms increased.

A central element of this study was to determine which stress coping strategies are most often chosen by students and to analyse the protective value of these mechanisms. The literature currently lacks such studies, while the available ones focus on other disciplines (e.g. emergency medicine), or analyse specific phenomena related to these strategies, such as psychoactive substance use or religious practices (Bryl et al., 2020; Nowakowska et al., 2009; Żołnierz et al., 2017). Understanding how students cope with mental stress is a key factor not only for the course of their studies, but also for their future professional life. Constructive strategies allow them to avoid professional burnout and better cope with the stress of their duties as doctors. In the present study, confrontational strategies were predominant among medical students (65.36% of respondents). In this category, acceptance and positive redefinition were the most popular, and considering all methods, students were least likely to resort to substance abuse. Students of other healthcare disciplines in Poland, including nurses and physiotherapists, also most often chose active methods of coping with stress-active action, planning and seeking instrumental support, and the selection of an appropriate strategy largely dependent on their sense of self-efficacy (Bodys-Cupak et al., 2019). With regard to gender differences, women were significantly more likely to seek support (both emotional and instrumental) from others or to push out the problem, while men were more likely than women to turn to psychoactive substances as a coping method. This type of breakdown partially coincides with data available in the literature (Madhyastha et al., 2014). Also, other studies have shown that women tend to choose strategies based on social and emotional support (Carver et al., 1989; Matud, 2004). However, papers indicating the opposite point of view are also present in the literature, in which men chose these strategies more frequently (Gibbons et al., 2011; Hirsch et al., 2015; Ptacek et al., 1992; Roohafza et al., 2014).

The available research on stress coping strategies mostly concludes that there is an advantage of confrontational over avoidant strategies in moderating the risk of depression and anxiety disorders. For example, a cross-sectional study among 20,000 non-academic employees at the University of Medical Sciences in Iran showed that all subtypes

of confrontational strategies – except acceptance – were protective against depression (Roohafza et al., 2014). Other studies confirm that avoidant strategies are a predictor of or accompany negative mood (Gibbons et al., 2011; Hirsch et al., 2015). Given the available data, the tendency of students to favour confrontational strategies should be viewed as a positive aspect, as such methods are usually associated with some protection against the negative effects of stress. Unfortunately, no such relationship was found in the study population. A potential explanation could be the failure of the cited mechanisms in the long term. As the study progresses and strategies such as planning and positive reframing prove unsuccessful, they may cease to perform their protective function. A surprising but optimistic result of the study is the low percentage of students who reported the use of psychoactive substances as a coping strategy. However, this is in contrast to available literature data. For example, a 2020 study of medical students found that more than 50% of students reported alcohol consumption as their way of coping with stress (Bryl et al., 2020). In addition, risky or harmful alcohol consumption was found in 16% of medical students and 22% of dental students. However, in the study group, there was no correlation between stress coping styles and the risk of alcohol dependence.

Given the low effectiveness of stress management methods among students, they need appropriate psychological help. Unfortunately, such solutions at medical universities are usually only short-term, and in cases that require more time, students are referred to outside specialists, and information about available assistance is often difficult to find – even absent from official university websites. However, it is worth noting that the Medical University of Silesia provides such information (Śląski Uniwersytet Medyczny w Katowicach: Informacje dla studentów ze specjalnymi potrzebami...; Walkiewicz and Guziak, 2021). Some institutions offer education about stress issues as part of optional classes, but it is hard to determine their effectiveness, and there is still a need to provide adequate psychological assistance outside of classes (Marcinkowska et al., 2013).

CONCLUSIONS

Medical students demonstrate increased levels of anger and a high risk of depressive disorders. Coping strategies become less effective as students continue their studies, and students themselves become susceptible to discouragement and burnout. A positive phenomenon is the fact that among this group the dominance of confrontational methods of coping with stress is observed, primarily the strategies of acceptance, planning, and positive reframing. Avoidance strategies, especially substance abuse, were significantly rarer in this group. Implementing targeted psychological support for students could potentially safeguard them from the erosion of defence mechanisms, thereby preventing adverse outcomes such as depressive disorders. Such interventions would also help identify individuals requiring psychotherapy.

Conflict of interest

The authors do not report any financial or personal connections with other persons or organisations which might negatively affect the content of this publication and/or claim authorship rights to this publication.

Author contribution

Original concept of study; critical review of manuscript; final approval of manuscript: KMW, MJK. Collection, recording and/or compilation of data: MHW, NR, ZP. Analysis and interpretation of data: MHW, NR, KMW. Writing of manuscript: MHW, NR, ZP, MJK.

References

- Adamia G, Świątnicka E, Wołodźko-Makarska L et al.: Ocena jakości życia studentów medycyny w zależności od liczby i nasilenia stwierdzonych objawów depresyjnych. *Psychiatr Pol* 2004; 38: 631–638.
- Bąk W: Pomiar stanu, cechy, ekspresji i kontroli złości. Polska adaptacja kwestionariusza STAXI-2. *Polskie Forum Psychologiczne* 2016; 21: 93–122.
- Bodys-Cupak I, Grochowska A, Zalewska-Puchała J et al.: Stres i radzenie sobie ze stresem studentów kierunków medycznych podczas pierwszych zajęć klinicznych – badania wstępne. *Stud Med* 2019; 35: 294–303.
- Brożyna K, Radzka A, Tkaczyk J et al.: Stress among medical students in Poland. *J Educ Health Sport* 2018; 8: 171–179.
- Bryl N, Czarnecka-Iwańczuk M, Romanowska et al.: Picie alkoholu jako sposób radzenia sobie ze stresem u studentów kierunków medycznych. *Psychiatr Pol* 2020; 54: 265–277.
- Brzozowski T (ed.): *Fizjologia człowieka*. 3rd ed., Edra Urban & Partner, Wrocław 2019.
- Carver CS: You want to measure coping but your protocol's too long: consider the brief COPE. *Int J Behav Med* 1997; 4: 92–100.
- Carver CS, Scheier MF, Weintraub JK: Assessing coping strategies: a theoretically based approach. *J Pers Soc Psychol* 1989; 56: 267–283.
- Cohen S, Williamson GM: Perceived stress in a probability sample of the United States. In: Spacapan S, Oskamp S (eds.): *The Social Psychology of Health. The Claremont Symposium on Applied Social Psychology*. SAGE Publications, Newbury Park, CA 1988: 31–67.
- Cohen S, Kamarck T, Mermelstein R: A Global measure of perceived stress. *J Health Soc Behav* 1983; 24: 385–396.
- Dyrbye LN, Eacker A, Durning SJ et al.: The impact of stigma and personal experiences on the help-seeking behaviors of medical students with burnout. *Acad Med* 2015; 90: 961–969.
- Gibbons C, Dempster M, Moutray M: Stress, coping and satisfaction in nursing students. *J Adv Nurs* 2011; 67: 621–632.
- Hirsch CD, Barlem E, Tomaszewski-Barlem JG et al.: Predictors of stress and coping strategies adopted by nursing students. *Acta Paul Enferm* 2015; 28: 224–229.
- Jaroszeńska AA, Tyras S, Dziewit M et al.: Prevalence of anxiety and depression among domestic and foreign medical students in Poland. *Pol Ann Med* 2020; 27: 135–137.
- Juczyński Z, Ogińska-Bulik N: *Narzędzia pomiaru stresu i radzenia sobie ze stresem*. Pracownia Testów Psychologicznych Polskiego Towarzystwa Psychologicznego, Warszawa 2009.
- Madhyastha S, Latha KS, Kamath A et al.: Stress, coping and gender differences in third year medical students. *J Health Manag* 2014; 16: 315–326.
- Marchewka W, Marchewka U, Król J et al.: Porównanie poziomu stresu i czynników go wywołujących pomiędzy polskimi studentami medycyny i stomatologii w okresie zajęć przedklinicznych. *Med Rehabil* 2023; 27: 49–56.
- Marcińska U, Lau K, Jośko-Ochojska J: O potrzebie kształcenia studentów medycyny w aspekcie wiedzy o stresie – w ramach zajęć fakultatywnych. *Hygeia Public Health* 2013; 48: 152–155.
- Marek K, Białoń P, Wichowicz H et al.: Przesiewowa ocena rozpoznania objawów depresyjnych i lękowych wśród studentów Akademii Medycznej w Gdańsku. *Psychiatr* 2005; 2: 217–224.
- Matud MP: Gender differences in stress and coping styles. *Pers Individ Dif* 2004; 37: 1401–1415.
- Moons WG, Eisenberger NI, Taylor SE: Anger and fear responses to stress have different biological profiles. *Brain Behav Immun* 2010; 24: 215–219.
- NFZ o zdrowiu – Depresja. Dane za lata 2013–2021. Available from: <https://ezdrowie.gov.pl/portal/home/badania-i-dane/zdrowe-dane/raporty/nfz-o-zdrowiu-depresja?modSingleId=120446>.
- Nowakowska K, Jabłkowska-Górecka K, Borkowska A: Style radzenia sobie ze stresem i zespół wypalenia zawodowego u studentów ratownictwa medycznego i ratowników medycznych. *Psychiatr Psychol Klin* 2009; 9: 242–248.
- Park GM, Hong AJ: "Not yet a doctor": medical student learning experiences and development of professional identity. *BMC Med Educ* 2022; 22: 146.

- Parnowski T, Jernajczyk W: Inwentarz Depresji Becka w ocenie nastroju osób zdrowych i chorych na choroby afektywne (ocena pilotażowa). *Psychiatr Pol* 1977; 11: 417–421.
- Pieniawska K, Śmiech K, Bar K et al.: [Can burnout manifest itself in college? A study of Polish medical students' population]. *Med Środ* 2017; 20: 22–31.
- Ptacek JT, Smith RE, Zanas J: Gender, appraisal, and coping: a longitudinal analysis. *J Pers* 1992; 60: 747–770.
- Puthran R, Zhang MW, Tam WW et al.: Prevalence of depression amongst medical students: a meta-analysis. *Med Educ* 2016; 50: 456–468.
- Rani RE, Ebenezer BS, Gunturu VV: A study on stress levels among first year medical students: a cross sectional study. *IOSR-JDMS* 2016; 15: 35–39.
- Rogowska AM, Kuśnierz C, Bokszczanin A: Examining anxiety, life satisfaction, general health, stress and coping styles during COVID-19 pandemic in Polish sample of university students. *Psychol Res Behav Manag* 2020; 13: 797–811.
- Roohafza HR, Afshar H, Keshteli AH et al.: What's the role of perceived social support and coping styles in depression and anxiety? *J Res Med Sci* 2014; 19: 944–949.
- Ross SE, Niebling BC, Heckert TM et al.: Sources of stress among college students. *Coll Stud J* 1999; 33: 312.
- Rotenstein L, Ramos M, Torre M et al.: Prevalence of depression, depressive symptoms, and suicidal ideation among medical students: a systematic review and meta-analysis. *JAMA* 2016; 316: 2214–2236.
- Satpathy P, Siddiqui N, Parida D et al.: Prevalence of stress, stressors, and coping strategies among medical undergraduate students in a medical college of Mumbai. *J Educ Health Promot* 2021; 10: 318.
- Seweryn M, Tyrała K, Kolarczyk-Haczyk A et al.: Evaluation of the level of depression among medical students from Poland, Portugal and Germany. *Psychiatr Danub* 2015; 27 Suppl 1: S216–S222.
- Silverthorn DU: *Fizjologia człowieka: zintegrowane podejście*. PZWL Wydawnictwo Lekarskie, Warszawa 2018.
- Spielberger CD, Sydeman SJ, Owen AE et al.: Measuring anxiety and anger with the State-Trait Anxiety Inventory (STAI) and the State-Trait Anger Expression Inventory (STAXI). In: Maruish ME (ed.): *The Use of Psychological Testing for Treatment Planning and Outcomes Assessment*. 2nd ed., Lawrence Erlbaum Associates Publishers, 1999: 993–1021.
- Śląski Uniwersytet Medyczny w Katowicach: Informacje dla studentów ze specjalnymi potrzebami, w tym z niepełnosprawnościami. Available from: <https://student.sum.edu.pl/aktualnosci-studenci-ze-specjalnymi-potrzebami/#wsparcie-psychologiczne>.
- Walkiewicz M, Guziak M: Availability of psychological support for medical students in Poland. *Int J Occup Med Environ Health* 2021; 34: 87–99.
- Wu J, Kuan G, Lou H et al.: The impact of COVID-19 on students' anxiety and its clarification: a systematic review. *Front Psychol* 2023; 14: 1134703.
- Zahorska-Markiewicz B, Małecka-Tendera E, Olszanecka-Glinianowicz M et al. (eds.): *Patofizjologia kliniczna. Podręcznik dla studentów medycyny*. 2nd ed., Edra Urban & Partner, Wrocław 2017.
- Żołnierz J, Wac K, Brzozowska A et al.: Self-efficacy, religiosity and opinions on the role of religion in coping with the difficulties of medical students. *J Educ Health Sport* 2017; 7: 185–201.