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Ewa Kupcewicz
University of Warmia and Mazury in Olsztyn
Daria Schneider-Matyka
Pomeranian Medical University in Szczecin
Anna Maria Cybulska
Pomeranian Medical University in Szczecin
Kamila Rachubińska
kamila.rachubinska@pum.edu.pl
Pomeranian Medical University in Szczecin
Helena Kaducáková
Catholic University in Ružomberok
Marcela Ižová
Catholic University in Ružomberok
Aleksandra Gaworska-Krzemińska
Medical University of Gdansk
Anna Andruszkiewicz
Nicolaus Copernicus University in Torun
Halina Doroszkiewicz
Medical University of Bialystok
Paweł Kukla
Jagiellonian University Medical College
Paweł Jastrzębski
University of Warmia and Mazury in Olsztyn
Elżbieta Grochans
Pomeranian Medical University in Szczecin

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Sense of self-efficacy and coping with stress among paramedic students in Poland and Slovakia: a cross-sectional comparative study

Ewa Kupcewicz[1], Daria Schneider-Matyka[2], Anna Maria Cybulska[2], Kamila Rachubińska[2,*], Helena Kaducáková[3,4], Marcela Ižová[3], Aleksandra Gaworska-Krzemińska[5], Anna Andruszkiewicz[6], Halina Doroszkiewicz[7], Paweł Kukla[8], Paweł Jastrzębski[9] and Elżbieta Grochans[2]

1 Department of Nursing, Collegium Medicum, University of Warmia and Mazury in Olsztyn, 14 C Zolnierska Street, 10-719 Olsztyn, Poland

2 Department of Nursing, Pomeranian Medical University in Szczecin, 48 Zolnierska Street, 71-210 Szczecin, Poland

3 Faculty of Nursing, Faculty of Health Sciences, Catholic University in Ružomberok, Ružomberok, Slovakia

4 Faculty of Health Care Sciences, Faculty of Humanities, Tomáš Baťa University in Zlín, Zlín, Czech Republic

5 Institute of Nursing and Midwifery, Medical University of Gdansk, 80-227 Gdansk, Poland

6 Department of Basic Clinical Skills and Postgraduate Education for Nurses and Midwives, Nicolaus Copernicus University in Torun, 85-821 Bydgoszcz, Poland

7 Department of Geriatrics, Medical University of Bialystok, 15-471 Bialystok, Poland

8 Faculty of Health Sciences, Jagiellonian University Medical College, Kraków, Poland

9 Department of Emergency Medicine, Collegium Medicum, University of Warmia and Mazury in Olsztyn, 14 C Zolnierska Street, 10-719 Olsztyn, Poland

*** Corresponding author:** Kamila Rachubińska, kamila.rachubinska@pum.edu.pl, Department of Nursing, Pomeranian Medical University in Szczecin, 48 Zolnierska Street, 71-210 Szczecin, Poland

Email addresses: EK, ewa.kupcewicz@uwm.edu.pl; DSM, daria.schneider-matyka@pum.edu.pl; AMC, anna.cybulska@pum.edu.pl; KR, kamila.rachubinska@pum.edu.pl; HKa, helena.kaducakova@ku.sk; MI, marcela.izova@ku.sk; AGK, aleksandra.gaworska-krzeminska@gumed.edu.pl; AA, anna.andruszkiewicz@cm.umk.pl; HD, halina.doroszkiewicz@umb.edu.pl; PK, pawel.kukla@uj.edu.pl; PJ, pawel.jastrzebski@uwm.edu.pl; EG, elzbieta.grochans@pum.edu.pl

Abstract

Background: Paramedic and other medical students are exposed to high levels of academic and clinical stress, which is shaped by individual psychological resources such as the sense of self-efficacy and the stress-coping strategies used. The aim of this study was to determine the role of generalised self-efficacy and stress-coping strategies in predicting stress intensity among paramedic students in Poland and Slovakia.

Methods: A cross-sectional diagnostic survey was conducted between May 2023 and January 2024 among 777 paramedic students (417 from six Polish universities and 360 from four Slovak universities). Standardised instruments were used: the Generalised Self-Efficacy Scale (GSES), the Perceived Stress Scale (PSS-10), and the Mini-COPE Inventory, together with a self-developed socio-demographic questionnaire. Group comparisons were performed using the chi-square test and Student's t-test; associations were assessed with Pearson's correlation coefficient; and predictors of stress intensity were identified using linear regression analysis. A p-value <0.05 was considered statistically significant.

Results: The mean level of generalised self-efficacy was 30.67 (SD=4.50) in the Polish subgroup and 30.96 (SD=4.11) in the Slovak subgroup, while the mean stress intensity was 19.61 (SD=6.85) and 19.50 (SD=6.45), respectively, with no statistically significant between-group differences ($p>0.05$). A significant negative correlation was observed between self-efficacy and stress intensity in both subgroups (Poland: $r=–0.42$; Slovakia: $r=–0.51$). Self-blame was the strongest positive predictor of stress intensity in both subgroups ($\beta=0.44$ and $\beta=0.27$, respectively), whereas generalised self-efficacy acted as a protective factor ($\beta=–0.17$ and $\beta=–0.27$, respectively). Adaptive coping strategies, including active coping and positive reframing, were associated with lower stress levels, while tension release and use of psychoactive substances were associated with higher stress levels.

Conclusions: Generalised self-efficacy and stress-coping strategies are key psychological resources shaping the well-being of paramedic students in both Poland and Slovakia. Self-blame emerged as the strongest risk factor for elevated stress, while self-efficacy and adaptive coping strategies served protective functions. These findings support the integration of psychological-resource-building components, such as self-efficacy training and adaptive coping skills, into paramedic education programmes.

Trial registration: Not applicable.

Keywords: self-efficacy; perceived stress; coping strategies; paramedic students; medical education; cross-cultural comparison; Mini-COPE; nursing education

Background

In recent years, in the field of medical education, there has been a growing interest in the psychological determinants of medical students' functioning. The medical education community is characterised by high cognitive demands, pressure to achieve, and frequent high-stakes assessment. As a result, medical students are particularly susceptible to academic stress, which can adversely affect their mental functioning and overall well-being [1]. The period of study is also associated with a number of developmental challenges, such as the need to adapt to new educational demands, changes in social relationships, and uncertainty about future career prospects [2].

Experiencing stress has been shown to have a negative impact on both an individual's mental and physical health, which increases, among other things, the risk of cardiovascular diseases. For medical students, stress represents a particularly significant threat, as it can lead to a deterioration in mental well-being and the development of depressive symptoms. Research indicates a strong link between perceived stress levels and the prevalence of mental health disorders among students, with stressors related to financial situation, academic relationships, and family relationships appearing to be particularly significant [3–5].

A literature review indicated that excessive psychological stress can impair concentration during academic activities and undermine students' confidence in their abilities, leading to a reduced sense of self-efficacy and deterioration in academic performance [6–8]. Moreover, stress impairs problem-solving abilities and reduces motivation to study, further contributing to a decline in the sense of self-efficacy. Psychological stress also affects emotion regulation – when under overwhelming pressure, students may find it difficult to cope effectively, leading to the accumulation of negative emotions and a further decline in the sense of self-efficacy [9].

Individual psychological resources are crucial for coping with stress, with particular importance attached to the sense of self-efficacy, a concept derived from Albert Bandura's social-cognitive theory. This term refers to an individual's belief in their ability to effectively take steps to achieve specific goals. The sense of self-efficacy influences both the level of motivation and the choice of coping strategies in difficult situations [10, 11]. Consequently, not only is this construct theoretically linked to psychological stress, but it also demonstrates significant practical relevance and strong mediating potential in empirical research, rendering it a key variable in explaining the mechanisms through which psychological stress affects academic performance [12, 13].

Numerous studies confirm that individuals with high self-efficacy tend to take on challenges more frequently, demonstrate greater perseverance when faced with difficulties, and employ more adaptive stress-coping strategies [14]. Among medical students, a high level of self-efficacy is associated with an orientation towards mastery of the material, higher motivation to study, more effective self-regulation of the learning process, and better functioning in an interprofessional collaboration setting. Meanwhile, a low level of self-efficacy is associated with higher levels of study-related anxiety, greater stress, and more severe academic burnout [15–17]. Under high-stress conditions, a decline in the sense of self-efficacy may limit students' sense of agency in educational tasks, undermining their engagement and academic achievement.

Although the impact of psychological stress on students' academic functioning has been widely analysed, significant research gaps persist in the literature. In particular, the psychological mechanisms underlying the relationship between academic stress and medical students' functioning, including the role of individual resources such as the sense of self-efficacy, remain insufficiently understood. The aim of this study was to determine the roles of the sense of self-efficacy and coping strategies in predicting stress intensity among Polish and Slovak paramedic students.

In order to achieve the research objective, answers were sought to the following research questions:

1. Are there, and to what extent, differences in the level of generalised self-efficacy and stress intensity among Polish and Slovak paramedic students?

2. To what extent is the generalised sense of self-efficacy associated with stress intensity and coping strategies among paramedic students, and what differences exist between the groups?

3. To what extent do generalised self-efficacy and stress-coping strategies have predictive significance with regard to stress intensity among Polish and Slovak paramedic students?

Methods

Settings and design

The study was conducted, using a diagnostic survey method, among paramedic students in Poland and Slovakia between May 2023 and January 2024. The survey was conducted at six Polish and four Slovak universities, involving direct contact with students. The inclusion criteria for the study were: age up to 30 years and informed consent to participate. The exclusion criterion was a lack of consent to participate in the study. The study was anonymous and voluntary. Paper questionnaires were distributed by research team members. Participants were informed about the aim and scope of the study, the rules for completing the questionnaires, and the option to withdraw from the study at any time without providing a reason or facing any consequences. The average time required to complete the set of questionnaires was approximately 15 minutes. A total of 850 questionnaire packages were distributed, of which 777 (91.41%) were selected for statistical analysis after verification of data completeness and accuracy. The collected data were coded and stored in a computerised database using an Excel spreadsheet, and the results were analysed on an aggregate basis. The study was cross-sectional and formed part of an international research project. It was conducted in accordance with the principles of the Declaration of Helsinki and the ethical procedures in force at the participating universities.

Research instruments

The following standardised research tools were used:

- The Generalised Self-Efficacy Scale (GSES), developed by R. Schwarzer and M. Jerusalem and adapted into Polish by R. Schwarzer, M. Jerusalem and Z. Juczyński [18];

- The Perceived Stress Scale (PSS-10), developed by S. Cohen, T. Kamarck and R. Mermelstein, in the Polish version by Z. Juczyński and N. Ogińska-Bulik [19];

- The Coping with Stress Inventory – Mini-COPE, developed by Charles S. Carver, in the Polish version by Z. Juczyński and N. Ogińska-Bulik [20].

To collect socio-demographic data, a self-developed questionnaire was used, which included questions on sex, age, year of study, place of residence, hours spent working at a computer, number of meals consumed, and degree of physical activity limitation.

Generalised Self-Efficacy Scale (GSES)

The GSES is used to assess an individual's overall level of belief about their ability to cope effectively with demanding situations and encountered difficulties. The tool comprises 10 statements forming a single measurement dimension. The respondent indicates the extent to which they agree with each statement by selecting one of four possible answers, rated on a scale of 1 to 4 (from "no" to "yes"). The total score represents the overall self-efficacy score, ranging from 10 to 40, with higher values indicating a stronger belief in one's own efficacy. The raw score can be converted to the sten scale, enabling normative interpretation: 1–4 sten scores indicate a low level of self-efficacy, 5–6 sten scores an average level, and 7–10 sten scores a high level. The scale exhibits good internal reliability, as confirmed by a Cronbach's alpha coefficient of 0.85 [18].

Perceived Stress Scale (PSS-10)

The PSS-10 is used to assess respondents' subjective stress over the past month. The questionnaire comprises 10 items assessing individual feelings and reactions to daily difficulties, life events, and ways of coping with them. Respondents specify the frequency of the described states by selecting one of five answers rated on a scale from 0 ("never") to 4 ("very often"). For the purposes of calculating the total stress intensity score, the answers to the positive items (items 4, 5, 7 and 8) are reverse-scored. The values for all items are then summed to obtain a total score ranging from 0 to 40, with a higher score indicating greater perceived stress intensity. The raw score can be converted to a sten scale: 1–4 sten scores indicate a low level of perceived stress, 5–6 sten scores an average level, and 7–10 sten scores a high stress intensity. The scale exhibits good internal reliability, as confirmed by a Cronbach's alpha coefficient of 0.86 [19].

Coping with Stress Inventory – Mini-COPE

The Mini-COPE inventory is a self-report questionnaire designed to assess available stress-coping strategies. The tool comprises 28 statements that form 14 distinct coping strategies, with each strategy represented by two statements. The respondent indicates the extent to which each statement relates to their life experiences to date by selecting one of four answers rated on a scale from 0 ("I hardly ever do this") to 3 ("I almost always do this"). Scores for individual strategies are calculated independently, by summing the points for the two statements assigned to each strategy and dividing the total by 2. The final score for each strategy ranges from 0 to 3 points and reflects the extent to which a particular coping style is characteristic of the respondent. The Mini-COPE inventory is characterised by good psychometric properties, as confirmed, e.g., by a Guttman split-half reliability coefficient of 0.86 [20].

Statistical analysis

Statistical analyses of the collected empirical data were conducted using STATISTICA, version 13 (TIBCO Software Inc., Palo Alto, CA, USA). The characteristics of the study group were presented using case counts and percentages. The homogeneity of the subgroups was assessed using the chi-square test (χ^2). Measures of location and variability used to describe the data included the arithmetic mean (M), median (Me), minimum (Min.), maximum (Max.), standard deviation (SD), and the 95% confidence interval for the mean. One-way analysis of variance (ANOVA) was used to assess variation in self-efficacy and stress intensity scores between the groups. Relationships between self-efficacy, stress intensity and coping strategies were assessed using Pearson's linear correlation coefficient (r). Linear regression analysis was used to identify predictors of stress intensity. The strength of the relationship between the analysed variables was interpreted according to Guilford's classification [21]. A p-value of <0.05 was accepted as the level of statistical significance.

Results

Participants

The study involved 777 paramedic students, including 417 (53.7%) from Polish universities (subgroup 1) and 360 (46.3%) from Slovak universities (subgroup 2). The two subgroups were comparable with respect to sex, age, year of study, place of residence, hours spent working at a computer, and number of meals consumed ($p>0.05$). Men were slightly more numerous than women in the entire sample (n=393; 51%), and the largest groups comprised first-year students (n=341; 44%) and individuals aged ≤20 years (n=341; 44%). Over half of the respondents lived with their family or a close relative (n=393; 51%); the majority used a computer for up to 3 hours a day (n=492; 63%) and reported consuming three meals a day (n=526; 68%) (Table 1).

Table 1. Distribution of socio-demographic variables in the study subgroups

Variable	Category	Total N=777 (n)	Total (%)	Poland n=417 (n)	Poland (%)	Slovakia n=360 (n)	χ^2	p-value
Sex	Female	384	49	197	47	187 (52%)	1.70	0.19
	Male	393	51	220	53	173 (48%)		
Year of study	First	341	44	187	45	154 (43%)	2.56	0.27
	Second	259	33	129	31	130 (36%)		
	Third	177	23	101	24	76 (21%)		
Age (years)	≤20	341	44	185	44	156 (43%)	1.35	0.51
	21	192	25	108	26	84 (23%)		

	≥22	244	31	124	30	120 (33%)		
Place of residence	With family/close relative	393	51	223	53	170 (47%)	3.02	0.08
	Independently	384	49	194	47	190 (53%)		
Hours/day at a computer	≤3h	492	63	253	61	239 (66%)	2.76	0.25
	4h–7h	230	30	133	32	97 (27%)		
	≥8h	55	7	31	7	24 (7%)		
Meals per day	1–2	178	23	90	22	88 (24%)	2.36	0.30
	3	526	68	292	70	234 (65%)		
	≥4	73	9	35	8	38 (11%)		
Physical activity limitation	Not limited	309	40	158	38	151 (42%)	61.0	<0.001
	Slight	205	26	118	28	87 (24%)		
	Moderate	221	28	99	24	122 (34%)		
	Significant	42	5	42	10	0 (0%)		

N – total size of study group; n – size of distinguished subgroup; subgroup 1 – students from Poland; subgroup 2 – students from Slovakia.

Variation in generalised self-efficacy, stress intensity and stress-coping strategies among students

Table 2 presents descriptive statistics and a comparison of the mean values of generalised self-efficacy (GSES) and stress intensity (PSS-10) between students from Polish and Slovak universities. The mean level of generalised self-efficacy was similar in both subgroups: 30.67 (SD=4.50) in the Polish group and 30.96 (SD=4.11) in the Slovak group, with no statistically significant difference (t=0.93; p=0.35). Likewise, no significant difference was observed in stress intensity, with mean PSS-10 scores of 19.61 (SD=6.85) among students from Poland and 19.50 (SD=6.45) among students from Slovakia (t=−0.23; p=0.82).

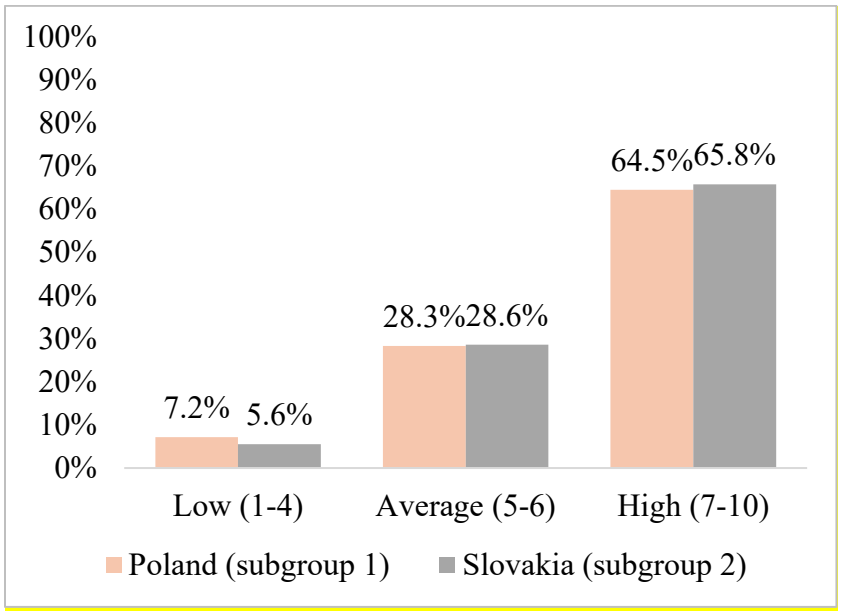
Table 2. Descriptive statistics and comparison of mean GSES and PSS-10 values between the Polish and Slovak student groups (Student's t-test)

	GSES – Poland (n=417)	**GSES – Slovakia (n=360)**	**PSS-10 – Poland (n=417)**	**PSS-10 – Slovakia (n=360)**
M	30.67	30.96	19.61	19.50
95% CI	30.24–31.11	30.53–31.39	18.95–20.27	18.83–20.17
Me	30	31	20	19
Min.–Max.	13–40	18–40	2–38	0–40

SD	4.50	4.11	6.85	6.45
Skewness	−0.35	−0.001	0.01	0.13
Kurtosis	1.24	0.30	−0.17	0.13
Student's t-test	0.93		−0.23	
p-value	0.35		0.82	

GSES – Generalised Self-Efficacy Scale; PSS-10 – Perceived Stress Scale.

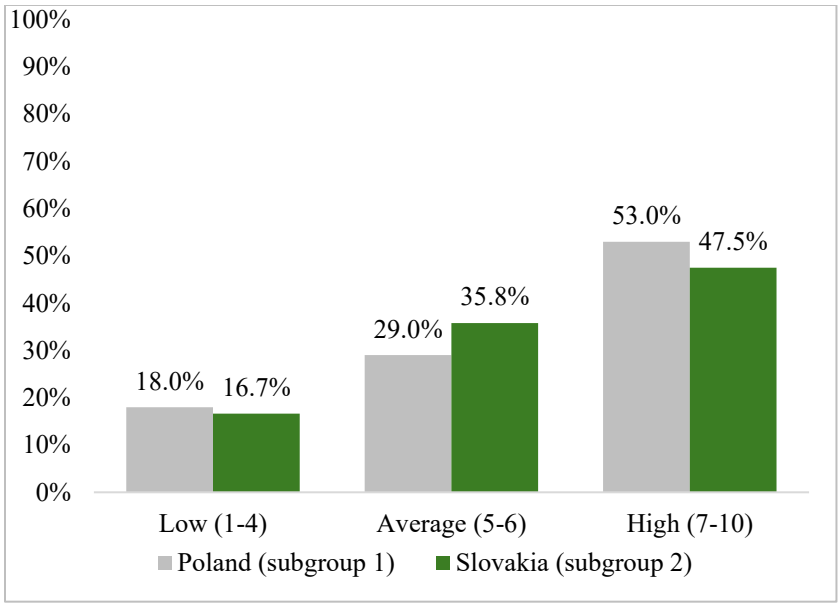
After converting the results to the sten scale, high GSES scores (7–10 sten) predominated in both subgroups, being noted for 64.5% of students from Poland and 65.8% of students from Slovakia. Average scores (5–6 sten) were found in a comparable proportion of respondents in both subgroups (28.3% vs 28.6%), while low scores (1–4 sten) were the least numerous (7.2% in the Polish subgroup and 5.6% in the Slovak subgroup) (Figure 1, to be inserted by the authors). No statistically significant differences in the distribution of GSES scores were observed between the study subgroups (χ^2=0.87; p=0.64).



χ2=0.87; p=0.64

Figure 1. Distribution of generalised self-efficacy scores on the sten scale in the two distinguished subgroups

The distribution of stress intensity, measured by the PSS-10 scale and expressed on the sten scale, indicated that in both subgroups the largest proportion of students had high stress scores (7–10 sten); this proportion was higher among students from Poland (53.0%) than those from Slovakia (47.5%). Average scores (5–6 sten) were more frequently observed in the Slovak subgroup (35.8%) than in the Polish subgroup (29.0%). Low stress intensity (1–4 sten) was observed in 18.0% of students from Poland and 16.7% from Slovakia (Figure 2, to be inserted by the authors). Despite differences in percentages, no statistically significant differences were observed in the distribution of stress intensity scores between the study subgroups (χ^2=4.13; p=0.12).



$\chi 2=4.13$; $p=0.12$

Figure 2. Distribution of stress intensity scores on the sten scale in the two distinguished subgroups

No statistically significant differences were found between students from Poland and Slovakia in terms of generalised self-efficacy (GSES; p=0.35) or stress intensity (PSS-10; p=0.82). Regarding stress-coping strategies, significant differences were observed between the study subgroups for selected strategies. Students from Slovakia scored significantly higher on positive reframing, turning to religion, and acceptance (p<0.001). In contrast, students from Poland scored significantly higher on strategies involving the use of psychoactive substances and tension release (p<0.001). No statistically significant differences were found for the remaining stress-coping strategies (Table 3).

Table 3. Differences in GSES, PSS-10 and Mini-COPE scores between the Polish and Slovak subgroups (N=777)

Category	Mini-COPE strategy	Poland M	Poland SD	Slovakia M	Slovakia SD	t (p-value)
Active coping	Active coping	2.05	0.64	2.05	0.68	0.10 (0.92)
	Planning	2.00	0.69	2.03	0.70	−0.55 (0.58)
	Positive reframing	1.58	0.75	1.91	0.79	−5.94 (<0.001)
Helplessness	Use of psychoactive substances	0.65	0.87	0.43	0.71	3.76 (<0.001)
	Cessation of action	0.77	0.73	0.74	0.74	0.46 (0.64)
	Self-blame	1.42	0.91	1.44	0.81	−0.31 (0.76)
Seeking support	Seeking emotional support	1.80	0.79	1.76	0.82	0.66 (0.51)

	Seeking instrumental support	1.63	0.81	1.67	0.73	−0.83 (0.40)
Avoidance behaviours	Turning to other activities	1.81	0.73	1.77	0.73	0.91 (0.37)
	Denial	0.77	0.74	0.74	0.76	0.49 (0.62)
	Tension release	1.45	0.73	1.15	0.67	5.98 (<0.001)
Other	Turning to religion	0.81	0.96	1.17	1.07	−4.88 (<0.001)
	Acceptance	1.84	0.66	2.01	0.65	−3.54 (<0.001)
	Sense of humour	1.37	0.80	1.45	0.83	−1.49 (0.14)

GSES – Generalised Self-Efficacy Scale; PSS-10 – Perceived Stress Scale. Statistically significant at $p<0.05$, $p<0.01$ or $p<0.001$ as indicated.

Relationship between generalised self-efficacy, stress intensity and stress-coping strategies

Figures 3 and 4 (to be inserted by the authors) illustrate the relationship between generalised self-efficacy (GSES) and stress intensity (PSS-10) in the subgroups of students from Poland and Slovakia. In both subgroups, a significant, moderate negative correlation was observed (Poland: $r=-0.42$; Slovakia: $r=-0.51$), indicating that higher GSES levels were associated with lower perceived stress.

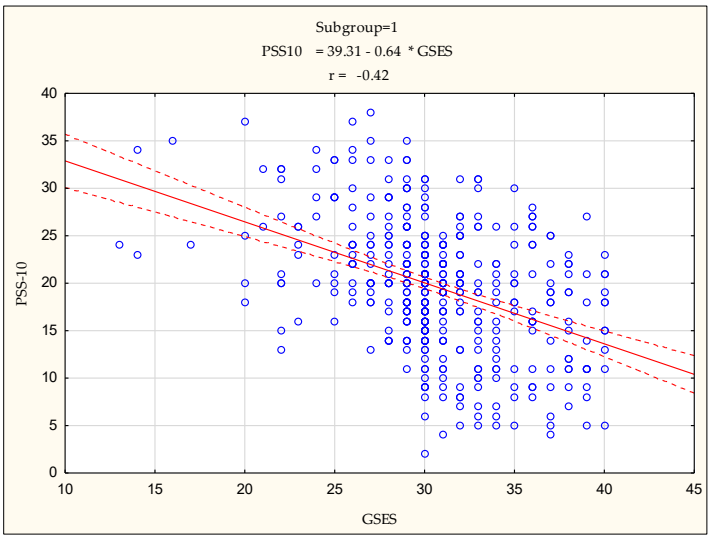


Figure 3. Scatter plot illustrating the relationship between generalised self-efficacy and stress intensity for subgroup 1

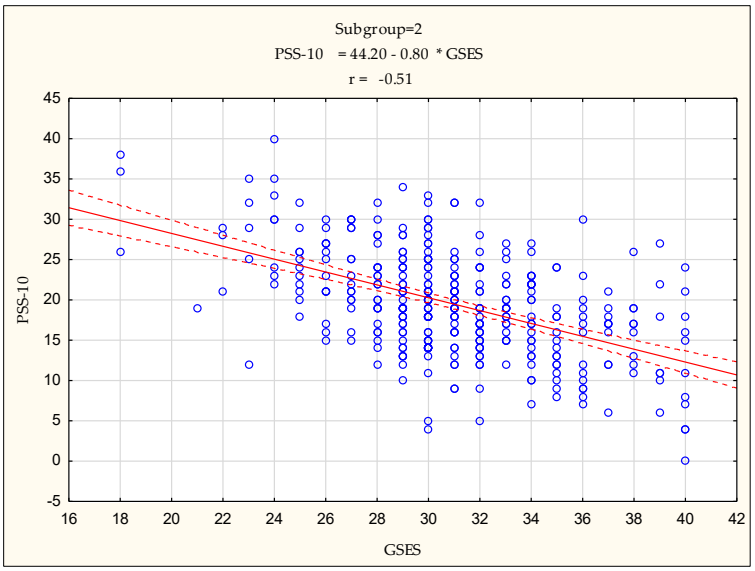


Figure 4. Scatter plot illustrating the relationship between generalised self-efficacy and stress intensity for subgroup 2

In both study subgroups (Table 4), statistically significant positive correlations were found between generalised self-efficacy and active-coping-oriented strategies, including active coping, planning and positive reframing ($p<0.0001$). At the same time, significant negative correlations were found between GSES and helplessness strategies (cessation of action and self-blame) in both subgroups ($p<0.0001$). No significant correlations were found between GSES and the use of psychoactive substances. Regarding support-seeking strategies, significant positive correlations were observed between GSES and seeking emotional support in both subgroups ($p<0.0001$), whereas the relationship with seeking instrumental support did not reach statistical significance. Among avoidance strategies, weak but significant negative correlations were observed between GSES and denial and tension release in both subgroups ($p<0.05$). A significant positive relationship between GSES and turning to other activities was found only in the Slovak subgroup ($p<0.01$). Generalised self-efficacy was significantly positively correlated with acceptance in both subgroups ($p<0.0001$). The relationships between GSES and turning to religion, as well as with sense of humour, were variable: a significant correlation with religious orientation was observed only in the Polish subgroup, while a correlation with sense of humour was observed only in the Slovak subgroup.

Table 4. Significance of the relationship between generalised self-efficacy and stress-coping strategies in the study subgroups

No.	Category	Mini-COPE strategy	Poland r	Poland p	Slovakia r	Slovakia p
1	Active coping	Active coping	0.440	<0.0001	0.425	<0.0001
		Planning	0.383	<0.0001	0.416	<0.0001

		Positive reframing	0.311	<0.0001	0.343	<0.0001
2	Helplessness	Use of psychoactive substances	−0.090	0.067	−0.055	0.302
		Cessation of action	−0.404	<0.0001	−0.309	<0.0001
		Self-blame	−0.330	<0.0001	−0.296	<0.0001
3	Seeking support	Seeking emotional support	0.163	<0.0001	0.200	<0.0001
		Seeking instrumental support	0.068	0.166	0.027	0.607
4	Avoidance behaviours	Turning to other activities	−0.022	0.661	0.132	0.01
		Denial	−0.145	0.003	−0.118	0.03
		Tension release	−0.125	0.01	−0.209	<0.0001
5	Turning to religion		0.136	0.005	0.004	0.943
6	Acceptance		0.260	<0.0001	0.335	<0.0001
7	Sense of humour		0.054	0.272	0.164	0.001

GSES – Generalised Self-Efficacy Scale; r – Pearson correlation coefficient.

Predictors of stress intensity

To identify predictors of stress intensity, a linear regression analysis was performed, with stress intensity as the dependent variable and generalised self-efficacy and stress-coping strategies as independent variables.

The regression model for the Polish subgroup was statistically significant and explained 46% of the variance in stress intensity ($R=0.67$; $R^2=0.46$; adjusted $R^2=0.45$). The strongest predictor of stress was the self-blame strategy, which showed a positive and statistically significant relationship with stress levels ($\beta=0.44$; $p<0.0001$): higher intensity of this strategy was associated with higher stress levels. Another significant predictor was generalised self-efficacy, negatively correlated with stress ($\beta=-0.17$; $p<0.0001$). The model also included turning to religion ($\beta=-0.14$; $p=0.0007$), active coping ($\beta=-0.13$; $p=0.004$), and tension release ($\beta=0.09$; $p=0.03$), although their contribution to explaining the variance in the dependent variable was relatively small (Table 5).

Table 5. Regression summary – predictors of stress intensity among students in subgroup 1 (Poland)

No.	Variable	R^2	β	B	SE B	t (p-value)

1	Self-blame	0.34	0.44	3.30	0.32	10.19 (<0.0001)
2	GSES	0.06	−0.17	−0.26	0.07	−3.90 (<0.0001)
3	Turning to religion	0.01	−0.14	−1.20	0.35	−3.41 (0.0007)
4	Active coping	0.02	−0.13	−1.35	0.47	−2.90 (0.004)
5	Tension release	0.01	0.09	0.80	0.37	2.15 (0.03)
R = 0.67; R^2 = 0.46; adjusted R^2 = 0.45						

The linear regression model for students from Slovakia was statistically significant and explained 47% of the variance in stress intensity (R=0.68; R^2=0.47; adjusted R^2=0.45). The strongest predictor of stress intensity was generalised self-efficacy, which remained in a statistically significant negative relationship with stress levels (β=−0.27; p<0.0001): higher self-efficacy was associated with lower stress intensity. Self-blame was also a significant positive predictor of stress (β=0.27; p<0.0001), indicating that stress intensity increased as this coping strategy intensified. Positive reframing (β=−0.18; p=0.0003) and tension release (β=0.16; p=0.0005) were also included in the model; positive reframing showed a negative relationship with stress intensity, while tension release was positively related to stress levels (Table 6).

Table 6. Regression summary – predictors of stress intensity among students in subgroup 2 (Slovakia)

No.	Variable	R^2	β	B	SE B	t (p-value)
1	GSES	0.26	−0.27	−0.43	0.07	−6.00 (<0.0001)
2	Self-blame	0.12	0.27	2.15	0.36	6.05 (<0.0001)
3	Positive reframing	0.05	−0.18	−1.45	0.40	−3.65 (0.0003)
4	Tension release	0.02	0.16	1.53	0.43	3.52 (0.0005)
R = 0.68; R^2 = 0.47; adjusted R^2 = 0.45						

Discussion

The aim of this study was to determine the role of the sense of self-efficacy and stress-coping strategies in predicting stress intensity among Polish and Slovak paramedic students. The results suggest that, across both study subgroups, generalised self-efficacy was relatively high, while perceived stress intensity remained moderate to high. No significant differences were found between Polish and Slovak students in self-efficacy levels or stress intensity, suggesting that medical students function under similar educational conditions regardless of country. These results are consistent with recent studies indicating that medical students worldwide experience elevated

stress levels due to considerable academic workload, examination pressure, and emotionally demanding clinical situations [22–24]. This study contributes new data on the role of self-efficacy and stress-coping strategies among a group of paramedic students from a cross-cultural perspective. The results obtained suggest that the psychological functioning of this group may be determined to a greater extent by the specific nature of medical education than by national differences.

The present study demonstrated a significant negative correlation between self-efficacy and stress intensity in both subgroups, meaning that students with higher self-efficacy experienced lower stress. This finding is consistent with modern approaches to social-cognitive theory, which hold that beliefs about one's own efficacy influence emotional regulation, the appraisal of stressful situations, and the selection of coping strategies [25]. Studies conducted in recent years have demonstrated that high levels of self-efficacy are associated with greater psychological resilience, lower levels of anxiety, and better academic performance among medical and paramedic students [26–29].

An analysis of stress-coping strategies revealed significant differences between students from Poland and Slovakia. Students from Slovakia more frequently used adaptive strategies, such as positive reframing, acceptance, or turning to religion, while students from Poland were more likely to report strategies related to tension release and the use of psychoactive substances. These findings may indicate the influence of cultural and environmental factors on preferred coping styles for stress. Cross-cultural studies emphasise that coping strategies are strongly linked to social norms, value systems, and the availability of social support, which may explain the observed differences between student populations [30, 31].

In both subgroups under analysis, the sense of self-efficacy was positively correlated with active coping strategies, planning, and positive reframing, and negatively correlated with helplessness strategies, such as cessation of action or self-blame. These findings are consistent with recent research indicating that individuals with high self-efficacy more frequently employ task-oriented and problem-focused coping strategies, while less frequently employing avoidance and emotional strategies [32–34]. Self-efficacy is considered to serve as a psychological resource that increases the sense of control over a situation and promotes more adaptive responses to stress [26, 35].

A linear regression analysis revealed that self-blame was the strongest predictor of stress intensity in both subgroups, and it was positively correlated with stress levels. This finding confirms previous studies indicating that strategies based on self-blame and guilt are among those most strongly associated with stress intensity, anxiety and depressive symptoms among medical students [36, 37]. At the same time, generalised self-efficacy proved to be a significant factor protecting against high stress levels, confirming its importance as a key personal resource in stress-coping models [26, 38]. The identification of self-blame as the strongest predictor of stress intensity emphasises the significant role of non-adaptive cognitive patterns in shaping students'

psychological burden, and suggests that interventions aimed at modifying negative thought patterns may be an effective stress-reduction strategy for this group [39].

Adaptive strategies, such as active coping and positive reframing, which reduced stress levels, and avoidance strategies, including tension release, which were associated with increased stress, also played a significant role in predicting stress. These findings are consistent with meta-analyses indicating that problem-focused coping is associated with better mental well-being, while an avoidance style increases the risk of stress and burnout [33, 40].

The lack of significant differences between students from Poland and Slovakia in overall stress levels and self-efficacy may suggest that the psychological functioning of paramedic students is determined to a greater degree by the specific nature of medical education than by national context. Similar conclusions were reported in international studies, which showed that high stress levels are common among medical students, regardless of country or education system [23, 24, 41–43].

These findings have significant practical implications, indicating that paramedic training programmes should include activities to develop psychological resources, particularly self-efficacy and adaptive stress-coping skills. The literature emphasises that interventions involving psychological resilience training, mindfulness, and psychological support can significantly reduce stress levels and improve medical students' functioning [44–46].

The similarity of the results obtained in both countries highlights the need for further international research to better understand the psychological mechanisms underlying stress during medical training and to develop effective preventive and educational programmes.

Limitations

The present study has several limitations that should be considered when interpreting the results obtained.

First, a cross-sectional design was employed, which does not allow for causal conclusions regarding the relationships among self-efficacy, coping strategies, and stress intensity; the identified relationships are correlational and do not allow a clear determination of the direction of the interactions between the variables under analysis.

Second, self-report instruments are associated with the risk of errors stemming from respondents' subjective assessments, social desirability effects, and response bias.

Third, the study sample comprised only paramedic students aged up to 30 years, which limits the possibility of generalising the results to other groups of medical students, older students, or practising paramedics.

Fourth, the study did not account for potential confounders, such as economic status, social support, or previous mental health issues.

Finally, the use of a general self-efficacy measure does not allow for the assessment of its specific dimensions related to academic or clinical functioning.

Implications for practice

Despite the limitations described above, the results obtained are of significant importance for educational and professional practice. First, the study confirmed that self-efficacy is an important psychological resource associated with lower levels of perceived stress; educational programmes for paramedic students should therefore include activities aimed at developing it.

Another important practical conclusion is that self-blame is among the strongest predictors of high stress levels. This indicates the need to implement psychological interventions to reduce non-adaptive coping strategies and to develop more constructive ones.

Moreover, the results point to the protective role of strategies such as active coping, planning, and positive reframing, which justify the inclusion of components such as stress coping, emotion regulation, and psychosocial competencies in educational programmes.

From a practical perspective, it is also advisable to introduce systems for the early identification of students at risk of high stress levels, particularly those characterised by low self-efficacy and a predominance of non-adaptive coping strategies. Support programmes, such as mentoring, psychological counselling, workshops, or psychological resilience training, can improve students' well-being and academic performance.

Finally, the similarities in student functioning observed in Poland and Slovakia suggest the possibility of developing universal psychological support programmes for medical students that could be implemented across various educational contexts. Overall, the results point to the need to integrate psychological components into medical education programmes, particularly to develop self-efficacy and stress-coping skills, and to identify and modify non-adaptive strategies.

Conclusions

- The sense of self-efficacy is an important psychological resource that supports stress regulation in paramedic students.
- The nature of the stress-coping strategies used plays a crucial role in shaping students' mental well-being.
- Students' functioning with regard to stress and coping with it is determined to a greater extent by the specific nature of medical education than by national context.
- Support in medical education should focus on developing individual resources and promoting adaptive coping strategies.

• The findings of this study may provide a basis for designing interventions aimed at supporting the mental health of medical students.

List of abbreviations

ANOVA: Analysis of variance; CI: Confidence interval; GSES: Generalised Self-Efficacy Scale; M: Arithmetic mean; Max.: Maximum; Me: Median; Min.: Minimum; Mini-COPE: Coping Orientation to Problems Experienced Inventory (brief version); PSS-10: Perceived Stress Scale (10-item version); SD: Standard deviation; SE: Standard error.

Declarations

Ethics approval and consent to participate

The study was conducted in accordance with the principles of the Declaration of Helsinki and was approved by the Senate Committee on Ethics of Scientific Research at the Higher School in Olsztyn, Poland (protocol code No. 3/2021, approved 15 June 2021). Written informed consent to participate was obtained from all participants prior to enrolment.

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

EK: conceptualization, methodology, software, investigation, writing – original draft, supervision, project administration, funding acquisition. EG: methodology, formal analysis, supervision. AA: validation, supervision. MI: validation, visualization. HKa: validation, visualization. HD: validation, visualization. AGK: validation. DSM: formal analysis, writing – review and editing.

AMC: resources, writing – review and editing. PK: data curation, visualization. KR: project administration, writing – review and editing. PJ: funding acquisition, visualization. All authors read and approved the final manuscript.

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