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Perceived Stress Levels among State Fire Service Officers

Abstract

RESEARCH OBJECTIVE: To assess perceived stress levels among State Fire Service (SFS) officers and identify relationships with demographic and occupational characteristics.

THE RESEARCH AND PROBLEM METHODS: Polish literature lacks research on stress differentiation within firefighter groups. Conducted from November 2025 to May 2026 at the Municipal Command of the State Fire Service in Krakow (KM PSP Kraków), the study involved 112 officers of the Voivodeship SFS in Krakow, recruited purposively. Officers on long-term sick leave, after a recent critical incident, or undergoing disciplinary proceedings were excluded. The Perceived Stress Scale PSS-10 (Polish adaptation by Z. Juczyński, 2001) was administered anonymously in paper-and-pencil format; participation was voluntary. Analyses in IBM SPSS 26 used t-tests, ANOVA, Pearson correlation, and chi-square tests.

THE PROCESS OF ARGUMENTATION: Hypotheses concerned the impact of gender, age, tenure, education, rank, and work schedule on stress, as well as the healthy worker effect and dominance of helplessness over self-efficacy.

RESEARCH RESULTS: SFS officers showed primarily low and moderate stress (95.5%; $M = 15.71$; $SD = 6.55$), consistent with the healthy worker effect; PSS-10 reliability was high ($\alpha = .858$). Only education significantly differentiated stress: officers with master's degrees reported less stress ($M = 14.37$; $SD = 6.65$) than those with bachelor's degrees ($M = 16.97$; $SD = 6.26$; $t(110) = 2.127$; $p = .036$;

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$d = 0.402$); other characteristics showed no significant effects. Age correlated weakly with stress ($r = .270$; $p = .016$). Helplessness dominated over self-efficacy.

CONCLUSIONS, INNOVATIONS, AND RECOMMENDATIONS:

Education appears to be a significant predictor of stress in the SFS, possibly reflecting greater decision-making autonomy, while the lack of influence from other variables indicates broadly universal occupational burdens. Psychoeducational programs for officers with bachelor's degrees and self-efficacy strengthening programs are recommended; with replication in larger samples, PSS-10 could support annual preventive examinations as an early warning.

KEYWORDS:

stress, public safety, PSS-10, uniformed services,
occupational psychology

INTRODUCTION

The term "occupational burnout" appeared in the scientific literature in 1974 through Herbert Freudenberger, who described the exhaustion of an individual caused by excessive demands of the work environment (Freudenberger, 1974). Together with Richelson, they defined this phenomenon as "a state of fatigue or frustration resulting from dedication to a cause that did not bring the expected reward" (Freudenberger & Richelson, 1980, p. 16). In parallel, Christina Maslach conducted research on individuals performing helping work, introducing a three-dimensional syndrome model encompassing emotional exhaustion, depersonalization, and reduced sense of personal accomplishment (Maslach, Schaufeli & Leiter, 2001). Burnout develops gradually, and its early signs often remain unnoticed, leading to loss of engagement, sleep problems, and disturbances in interpersonal relationships (Schaufeli & Enzmann, 1998, p. 36).

The construct of burnout has since become central to occupational health psychology, generating thousands of empirical studies across professions. Its relevance for uniformed services has drawn particular attention due to the unique convergence of physical danger, emotional exposure, and organizational pressure characteristic of these occupations. Firefighters, police officers, paramedics, and military personnel operate in contexts where the boundary between professional duty and personal safety is routinely blurred. This distinctive

feature of uniformed professions demands theoretical frameworks that account for both acute traumatic exposure and chronic organizational stressors.

The Job Demands-Resources (JD-R) model, developed by Demerouti and colleagues, offers one such framework by positing that burnout arises from an imbalance between high job demands and insufficient resources, whether personal or organizational (Bakker & Demerouti, 2017). In this perspective, the firefighter profession exemplifies extreme demands: physical exertion, exposure to death and injury, shift work disrupting circadian rhythms, and the moral burden of life-and-death decisions. Simultaneously, resources such as social support, autonomy, and recovery opportunities are often constrained by hierarchical structures and operational imperatives. The JD-R model thus predicts elevated burnout risk in firefighter populations, yet empirical findings frequently contradict this expectation.

The apparent paradox of resilient firefighters has been explained through the concept of the healthy worker effect, a form of selection bias whereby individuals who enter and remain in demanding occupations possess above-average physical and psychological constitution (Strizhakov et al., 2021). This effect complicates the interpretation of stress levels in occupational samples, as observed scores may reflect both genuine resilience and systematic selection of resilient individuals. Disentangling these mechanisms requires longitudinal designs beyond the scope of cross-sectional studies, yet even cross-sectional data can reveal important patterns of variation within apparently homogeneous groups.

Stress measurement in occupational psychology has relied predominantly on self-report instruments, among which the Perceived Stress Scale (PSS-10) developed by Cohen, Kamarck and Mermelstein (1983) stands out for its brevity and cross-cultural validity. The Polish adaptation by Juczynski (2001) has been extensively validated in Polish working populations, with established norms and demonstrated sensitivity to occupational differences. The scale captures the degree to which respondents appraise their life situations as unpredictable, uncontrollable, and overloaded, thus operationalizing the transactional stress model of Lazarus and Folkman (1984). This theoretical grounding makes PSS-10 particularly suitable for studying professions where situational unpredictability is inherent to the work itself.

Previous research on firefighter stress has yielded inconsistent results regarding demographic and occupational predictors. Some studies identified gender differences, with female firefighters reporting higher stress due to minority status and additional social burdens (Hulett et al., 2008). Others found tenure effects, where accumulated exposure to traumatic events increased stress over time (Witt et al., 2018). Educational level has rarely been examined as a predictor, despite its established association with coping resources and decision-making autonomy in the broader occupational literature. Rank and work schedule have similarly produced mixed findings, suggesting that local organizational cultures may moderate their effects.

The Polish context adds further complexity. The State Fire Service operates under a centralized command structure with limited regional autonomy, potentially homogenizing stress experiences across individual characteristics. Simultaneously, recent reforms have increased educational requirements for promotion, creating a natural experiment in which educational attainment may serve as a proxy for both cognitive resources and organizational position. Understanding how these factors interact within the Polish SFS is essential for designing targeted interventions and for contributing to the international literature on firefighter mental health.

The profession of a firefighter is considered one of the most psychologically demanding among uniformed professions. SFS officers on a daily basis confront direct threats to life, time pressure, shift work schedules, and traumatic events (Oleksy, 2015; Sawicki, 2012). In Polish literature, the key tool for measuring subjectively perceived stress is the PSS-10 Scale in the adaptation by Zygfryd Juczynski (Juczynski, 2001; Juczynski & Oginska-Bulik, 2009), widely used in psychological and medical research, yet hitherto not comprehensively utilized for analyzing stress level differentiation within firefighter groups. This study aims to fill this gap.

The objective was to assess the level of perceived stress among SFS officers and identify relationships between stress level and selected sociodemographic characteristics. Based on the literature, five research hypotheses were formulated: H1: There is a significant difference in perceived stress levels between women and men in the group of SFS officers. H2: Higher age and longer tenure are associated with higher levels of perceived stress. H3: There are significant differences

in stress levels due to education, rank, and work schedule. H4: SFS officers show higher levels of helplessness than self-efficacy in coping with stress. H5: The stress level among firefighters is lower than in the general population, consistent with the healthy worker effect.

METHODS AND RESEARCH TOOLS

Participants

The study was conducted over a six-month period from November 2025 to May 2026 at the Municipal Command of the State Fire Service in Krakow (KM PSP Kraków). The final sample comprised 112 officers of the Voivodeship SFS in Krakow (34 women, 30.4%; 78 men, 69.6%). Recruitment followed a purposive non-probability sampling strategy: potential participants were approached during routine briefings and through internal announcements posted at the command. Officers were eligible if they were in active service (operational or administrative) with at least six months of tenure; those on medical leave, recently involved in a major critical incident (within four weeks), or undergoing disciplinary review were excluded. The response rate was approximately 68% of those eligible.

Table 1. Demographic Characteristics of the Study Group (N = 112)

Variable	Category	n	%
Gender	Female	34	30.4
	Male	78	69.6
Age (years)	M = 40.44; SD = 10.43; range 24–64		
Education	Bachelor's degree	58	51.8
	Master's degree	54	48.2
Rank	Privates	41	36.6
	Non-commissioned officers	40	35.7
	Aspirants	21	18.8
	Officers	10	8.9
Tenure	0–5 years	38	33.9
	6–10 years	46	41.1
	11–15 years	2	1.8
	16–20 years	16	14.3
	>20 years	9	8.0

Work schedule	Shift work	91	81.3
	Day work	21	18.7
Marital status	Married	53	47.3
	Single	37	33.0
	Divorced	22	19.6

Note: N = 112. The group is male-dominated (69.6%), reflecting the gender structure of the formation. Mean age 40.4 years (SD = 10.4) indicates a mature professional group. The vast majority work shift schedules (81.3%).

Source: own study.

Instrument

The Perceived Stress Scale PSS-10 (Cohen, Kamarck, & Mermelstein, 1983) was used in the Polish adaptation by Z. Juczynski (Juczynski, 2001; Juczynski & Oginska-Bulik, 2009). The scale comprises 10 items on a 5-point frequency scale (0–4), referring to the past month. Positive items (4, 5, 7, 8) are reverse-scored. Maximum score: 40 points. Sten norms: 1–4 – low level, 5–6 – moderate, 7–10 – high stress level. Reliability: $\alpha = 0.86$; test-retest: 0.90 (2 days), 0.72 (4 weeks; Juczynski, 2001, p. 92).

Statistical Analysis

Data were analyzed in IBM SPSS Statistics 26. Normality of distribution was tested using the Kolmogorov-Smirnov and Jarque-Bera tests. For comparing means in two groups, Student's t-test was used; for more than two groups -one-way ANOVA with post-hoc tests (Bonferroni). The relationship between age and stress was examined using Pearson and Spearman correlation. Reliability was assessed using Cronbach's α . The significance level was set at $\alpha = 0.05$; effect size – Cohen's d (<0.2 negligible, 0.2–0.5 small, 0.5–0.8 medium, >0.8 large; Cohen, 1988, p. 40).

Procedure and Ethics

Data were collected via paper-and-pencil questionnaires administered individually or in small groups during duty hours in a designated quiet

room at the command headquarters. No personal identifying information was recorded; each respondent received a sealed envelope with the questionnaire and a brief information sheet. Oral and written information about the study's aim, voluntary nature, and the right to withdraw at any time without professional consequences was provided beforehand. The study was conducted in accordance with the ethical standards of the Declaration of Helsinki. Because the research involved non-invasive, anonymous questionnaire data collected from adult volunteers, formal ethical approval was not required under applicable national guidelines for this type of study. All participants provided written informed consent after being orally and in writing informed about the study's purpose, the voluntary nature of participation, the anonymity of responses, and the right to withdraw without consequence.

RESULTS

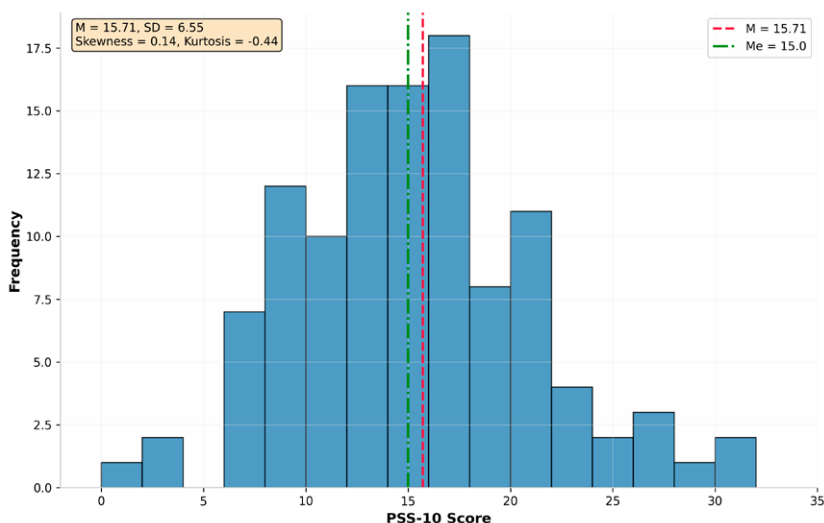
Descriptive Statistics and Reliability

The distribution of PSS-10 scores showed normality (Kolmogorov-Smirnov: $D = .070$; $p = .614$; Jarque-Bera: $JB = 1.293$; $p = .524$). Mean score: $M = 15.71$; $SD = 6.55$; $Mdn = 15$; range 0–32; $IQR = 9.5$. The distribution was characterized by slight right skewness (.143) and mild kurtosis (–.441), and close mean and median values indicate a distribution approximately symmetrical and close to normal. The histogram illustrates the concentration of scores around the mean, with isolated observations in the high value range, corresponding to low frequency of extreme stress in this occupational group.

Internal reliability: $\alpha = .858$. All items showed positive correlation with the total score; removing any item would not increase α above .871 (item 4 -coping). The highest correlation was shown by item 7 (control of irritation): $r = .859$ ($p < .001$). The lowest -item 2 (things getting out of control): $r = .401$ ($p < .001$). Item analysis reveals a clear pattern: positive (reversed) items describing sense of control and coping achieved higher means ($M = 2.70$ – 2.96) than negative items ($M = 1.60$ – 2.29), suggesting that officers more frequently declare ability to manage situations than direct feelings of being overwhelmed. Particularly high mean for item 7 (control of irritation; $M = 2.96$; $SD = 0.76$) indicates good emotional regulation in stressful situations.

Stress level distribution: low (0–13 pts.) – 44 persons (39.3%), moderate (14–26 pts.) – 63 (56.2%), high (27–40 pts.) – 5 (4.5%). Combined low/moderate: 95.5%. Alternative division (low 0–10, moderate 11–18, high 19–40) showed: low – 28 (25.0%), moderate – 48 (42.9%), high – 36 (32.1%). Regardless of the criterion used, the vast majority of respondents remain within the range of low or moderate psychological tension. Figure 3 visualizes this structure.

Figure 1. Distribution of Perceived Stress Scale (PSS-10) Scores among Fire-fighters (N = 112)



Source: own study.

Table 2. Perceived Stress Scale PSS-10 Item Analysis

Item	Content	Type	M	SD	Me	r with total	α if deleted
P1	Upset by something unexpected	Negative	1.92	1.07	2	0.59	0.840
P2	Unable to control important things	Negative	1.63	1.17	2	0.40	0.822
P3	Nervous and stressed	Negative	2.29	0.98	2	0.62	0.840
P4	Dealt with problems (rev.)	Positive	2.70	1.13	3	0.52	0.871
P5	Things going your way (rev.)	Positive	2.71	0.81	3	0.58	0.838
P6	Could not cope with things	Negative	1.64	1.06	2	0.61	0.849

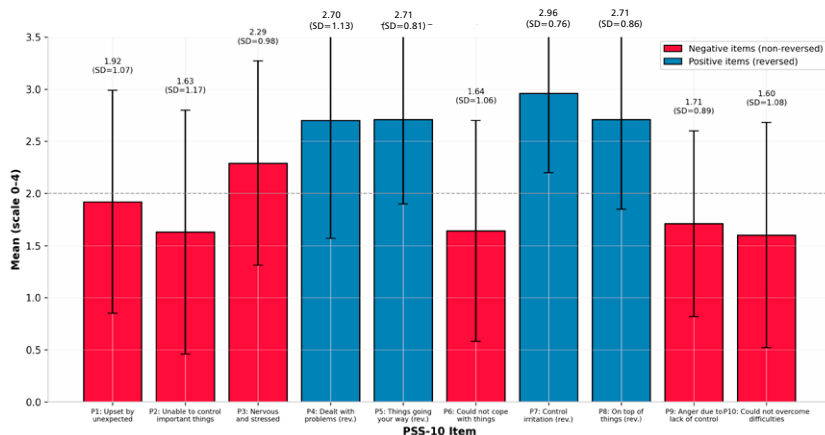
Perceived Stress Levels among State Fire Service Officers

P7	Control irritation (rev.)	Positive	2.96	0.76	3	0.86	0.855
P8	On top of things (rev.)	Positive	2.71	0.86	3	0.58	0.839
P9	Anger due to lack of control	Negative	1.71	0.89	2	0.55	0.845
P10	Could not overcome difficulties	Negative	1.60	1.08	1	0.54	0.844
Full scale			15.71	6.55	15	—	0.858

Note: N = 112. Type: Negative—items requiring reversal when calculating score; Positive—reversed items. r with total—point-biserial correlation with total score. α if deleted—scale reliability after removing the given item. The highest correlation is shown by P7 (control irritation; $r = 0.86$), confirming its key role in stress measurement.

Source: own study.

Figure 2. Mean Scores of Individual Perceived Stress Scale (PSS-10) Items among Firefighters (N = 112)



Source: own study.

Table 3. Distribution of Perceived Stress Levels according to PSS-10 Categories

Stress Level	PSS-10 Range	n	%	Cumulative %
Low	0–13 pts	44	39.3	39.3
Moderate	14–26 pts	63	56.2	95.5
High	27–40 pts	5	4.5	100.0
Total		112	100.0	—

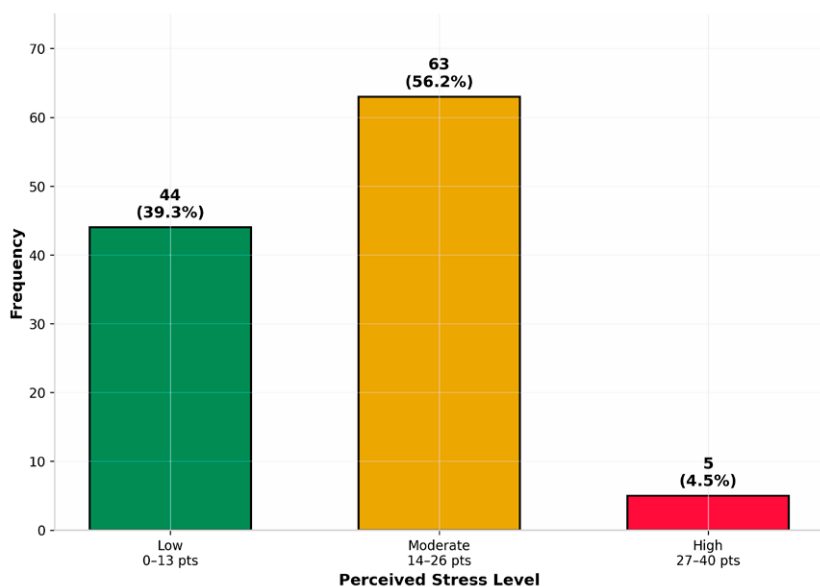
Note: N = 112. Classification according to PSS-10 criteria. Combined low and moderate stress levels cover 95.5% of respondents, indicating fairly good psychological condition of the group.

Alternative sten division (Juczyński, 2001):

- Low (stens 1–4): 0–10 pts — 28 persons (25.0%)
- Moderate (stens 5–6): 11–18 pts — 48 persons (42.9%)
- High (stens 7–10): 19–40 pts — 36 persons (32.1%)

Source: own study.

Figure 3. Distribution of Perceived Stress Levels (PSS-10) among Firefighters (N = 112)

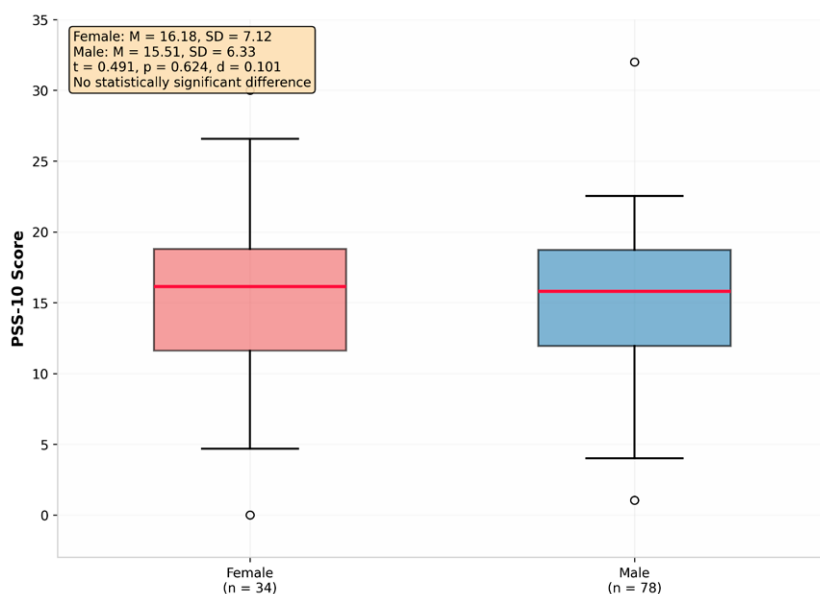


Source: own study.

Hypothesis Verification

H1 (gender) – rejected. Women: $M = 16.18$; $SD = 7.12$. Men: $M = 15.51$; $SD = 6.33$. $t(110) = 0.491$; $p = .624$; $d = 0.101$ (negligible). Mann-Whitney U test: $U = 1407.5$; $p = .608$. The lack of differences may result from homogenization of stress experiences in the firefighter environment, where identical professional demands equalize feelings regardless of gender. Box plots for both genders illustrate nearly identical medians ($Mdn = 15$ for women and men) and similar interquartile ranges. Greater variability in the women's group (whisker reaching value 0) may reflect the smaller size of this subgroup ($n = 34$ vs. $n = 78$), rather than significant differences in the nature of experienced stress.

Figure 4. Comparison of Stress Levels by Gender among Firefighters

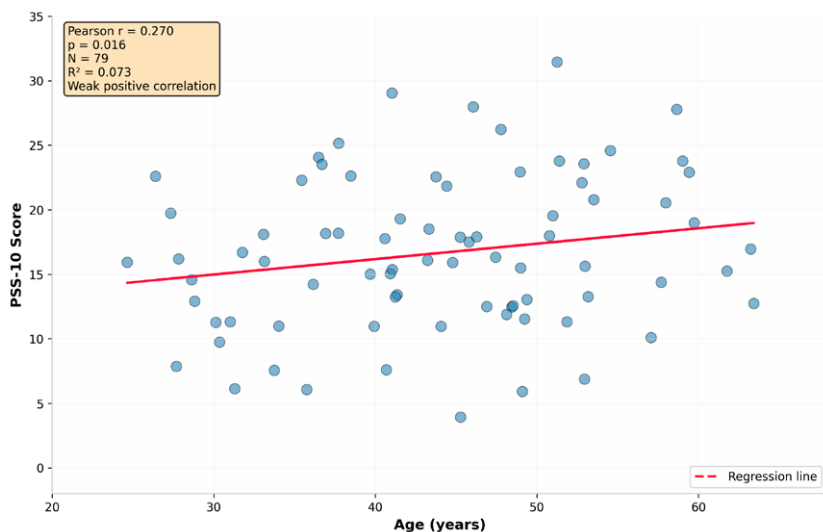


Source: own study.

H2 (age, tenure) – partially confirmed (age). Age: Pearson $r = .270$; $p = .016$; Spearman $\rho = .251$; $p = .026$; $R^2 = .073$. The correlation is statistically significant but weak – age explains only 7.3% of stress level variance. ANOVA for age groups: $F(3, 108) = 0.990$; $p = .401$. Kruskal-Wallis: $H = 2.576$; $p = .462$. Tenure: $F(4, 107) = 0.806$; $p = .806$.

A scatter plot of age against PSS-10 score with a regression line shows dispersion of points around a slightly rising straight line. A cluster of observations is visible in the 25–45 year range with scores of 10–25 pts., while the highest stress values appear both among younger (ca. 30 years, score 32 pts.) and older officers (ca. 60 years, score 30 pts.). This suggests that age itself is not a strong predictor, and the observed correlation may be an effect of other mediating variables such as changing task structure or increasing responsibility with promotions.

Figure 5. Relationship between Age and Perceived Stress Level among Firefighters

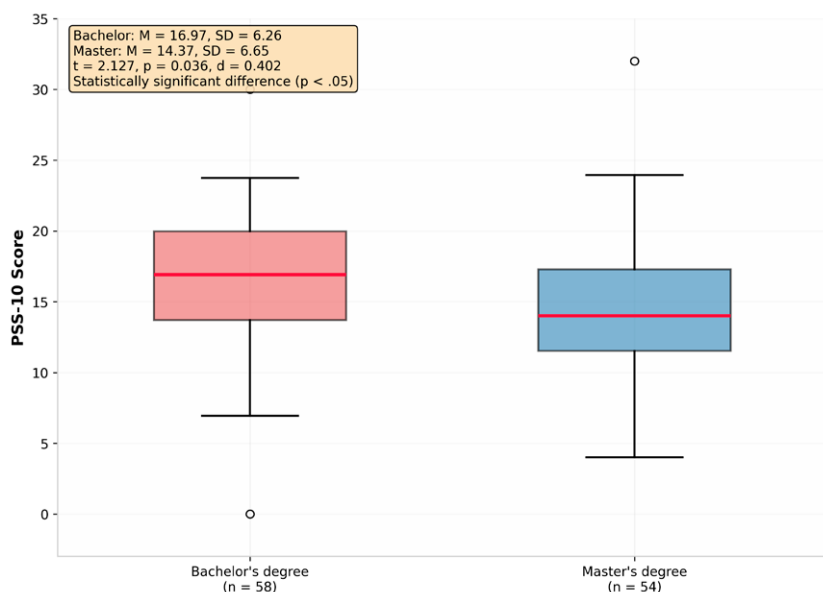


Source: own study.

H3 (education, rank, schedule) partially confirmed (education). Bachelor's degree: $M = 16.97$; $SD = 6.26$. Master's degree: $M = 14.37$; $SD = 6.65$. $t(110) = 2.127$; $p = .036$; $d = 0.402$ (small, practically significant). Kruskal-Wallis: $H = 5.888$; $p = .015$. Rank: $F(3, 108) = 0.463$; $p = .709$. Work schedule: $t(110) = -0.776$; $p = .440$. Marital status: $F(2, 109) = 1.146$; $p = .320$. A comparison of box plots for both educational groups clearly contrasts them: Median for master's degree ($Mdn = 13$) is lower than for bachelor's degree ($Mdn = 17$), and the upper quartile of the master's group (ca. 19 pts.) does not exceed the median of the bachelor's group. Greater variability in the bachelor's group, with

upper outliers, indicates more diverse stress levels among officers with lower education. The difference due to education is consistent with Karasek's demands-control-support model (Karasek, 1979, p. 288) – greater decision-making autonomy in managerial positions and better coping strategies (Wojcieszek, Nawalana, & Majda, 2017, p. 52) act as buffering factors.

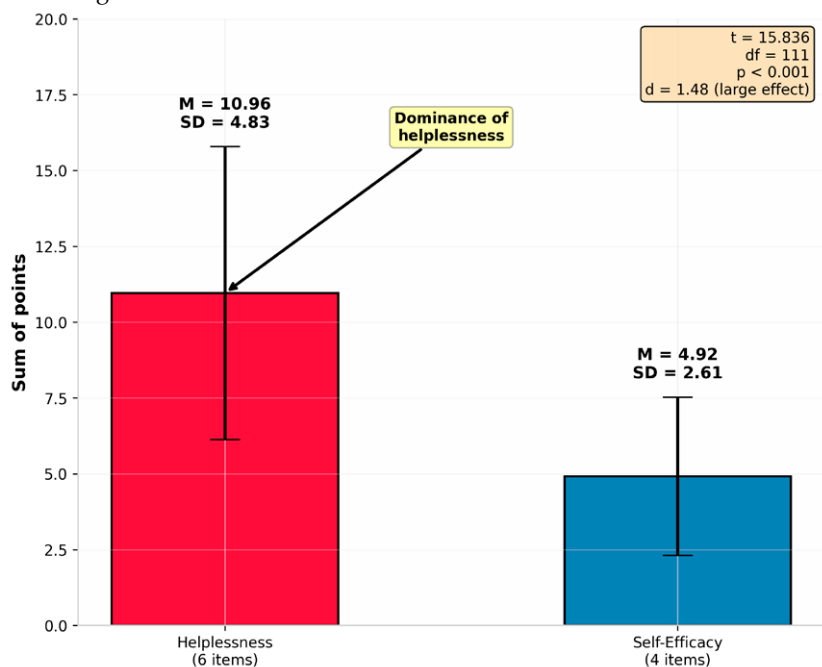
Figure 6. Comparison of Stress Levels by Education among Firefighters



Source: own study.

H4 (helplessness vs. self-efficacy) – confirmed. Helplessness (items 1, 2, 3, 6, 9, 10): M = 10.96; SD = 4.83. Self-efficacy (items 4, 5, 7, 8): M = 4.92; SD = 2.61. $t(111) = 15.836$; $p < .001$; $d = 1.48$ (large). The dominance of helplessness reflects the specificity of rescue work -an officer often faces unpredictable and difficult-to-control situations. The simultaneous low overall stress level suggests developed psychological resilience based on acceptance of limited control.

Figure 7. Comparison of PSS-10 Subscales: Helplessness vs. Self-Efficacy among Firefighters



Source: own study.

H5 (healthy worker effect) the data are consistent with this hypothesis, though it cannot be confirmed in a cross-sectional design. The mean of the studied group ($M = 15.71$; $SD = 6.55$) is close to the norm of the Polish working population ($M = 14.87$; $SD = 5.72$; Juczynski, 2001, p. 92). Only 4.5% showed high stress levels. This pattern is compatible with positive selection – rigorous psychophysical examinations eliminate individuals with low stress resistance (Strizhakov et al., 2021). However, longitudinal or comparative data would be needed to distinguish true resilience from selection effects.

DISCUSSION

The prevalence of low and moderate stress (95.5%) is compatible with the healthy worker effect hypothesis (H5). In a cross-sectional study such as this, we cannot rule out that the observed distribution reflects,

at least in part, selection processes at entry: rigorous psychophysical screening may filter out individuals with low stress resistance (Strizhakov et al., 2021). The mean is close to the norm of the working population (Juczynski, 2001, p. 92). Education is a significant predictor of stress level -officers with master's degrees experience significantly less stress ($M = 14.37$; $SD = 6.65$) than those with bachelor's degrees ($M = 16.97$; $SD = 6.26$), which partially confirms H3 and is consistent with Karasek's model (Karasek, 1979, p. 288). Greater decision-making autonomy and better stress coping strategies act as buffering factors (Wojcieszek, Nawalana & Majda, 2017, p. 52).

No significant effect of gender, rank, tenure, work schedule, or marital status on perceived stress level was found, leading to rejection of H1 and suggesting a universal nature of occupational burdens in the SFS. The lack of tenure effect indicates that adaptive coping mechanisms developed during service compensate for the accumulation of burdens (Witt, Stelcer, & Czarnecka-Iwanczuk, 2018, p. 548). Age shows a weak but significant positive correlation, partially confirming H2. Respondents experience dominance of helplessness over self-efficacy (H4 confirmed), reflecting the specificity of rescue work. The simultaneous low overall stress level suggests development of specific psychological resilience based on acceptance of limited control. The PSS-10 Scale shows high internal reliability in the firefighter population ($\alpha = .858$), confirming its usefulness in stress research in this group and opening the possibility of systematic stress level monitoring.

These findings carry several implications for both theory and practice. From a theoretical standpoint, the results support the JD-R model's prediction that resources, particularly those related to education and the autonomy it confers, buffer the impact of high job demands. The Polish SFS context offers a unique testing ground for this model because the centralized command structure limits variability in organizational resources, making individual-level resources such as education more salient. The absence of gender and tenure effects, contrary to some international findings, may reflect the specific organizational culture of the Polish SFS, where uniform training and operational procedures homogenize experiences across demographic categories.

The cross-sectional nature of this study means we must be cautious in interpreting the healthy worker effect. The low stress prevalence could indeed indicate genuine resilience fostered by training

and peer support, but it could equally reflect the fact that vulnerable individuals have already left the service. Longitudinal designs tracking individuals from recruitment through retirement would better disentangle genuine resilience from selection artifacts. Such designs would also clarify whether the weak age effect observed here represents a genuine increase in stress vulnerability or a cohort effect related to changing recruitment standards over time.

From a practical perspective, the education effect suggests that investment in higher education for SFS officers may yield mental health dividends beyond the obvious professional benefits. The Polish SFS has gradually increased educational requirements for promotion, and these findings provide empirical support for that policy direction. However, the effect size is small ($d = 0.402$), indicating that education is not a panacea. Complementary interventions targeting self-efficacy, given the confirmed dominance of helplessness, may be equally important. Cognitive-behavioral techniques focusing on acceptance of limited control, a core feature of rescue work, could help officers reconcile the gap between their desire for control and the inherent unpredictability of emergency situations.

The lack of gender differences, while contrary to some international studies, is consistent with the argument that the firefighter environment homogenizes stress experiences. This does not imply that female officers face no unique challenges; rather, it suggests that these challenges may not manifest in overall PSS-10 scores. Future research should examine more nuanced measures of occupational stress, including gender-specific stressors such as equipment fit, facility adequacy, and social integration, which were identified in the landmark study by Hulett et al. (2008) but may not be captured by general perceived stress scales.

The dominance of helplessness over self-efficacy, despite low overall stress levels, warrants particular attention. This pattern suggests that firefighters have developed a pragmatic form of resilience: they accept that many situations are beyond their control while maintaining functional performance. This acceptance-based coping style aligns with mindfulness-based approaches and may explain why overall stress remains low despite high exposure to uncontrollable events. Interventions that strengthen this acceptance while simultaneously building active coping skills could represent an optimal strategy for the SFS context.

PRACTICAL RECOMMENDATIONS

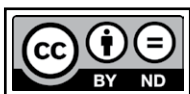
It is recommended to: (1) implement psychoeducational programs supporting problem-oriented strategies, targeted at officers with bachelor's degrees; (2) develop self-efficacy strengthening programs based on cognitive-behavioral techniques for the entire group, with particular attention to acceptance of limited control as an element of rescue work; (3) continue research with a larger number of women and officers over 45 years of age, as well as longitudinal studies; (4) consider including PSS-10 in annual preventive examinations as an early warning system for occupational burnout pending further validation; (5) consider position rotation for officers with tenure exceeding 10 years and implement mentoring for high-risk groups.

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