The measure of psychological state and burnout level among the paramedics in the National Ambulance Services of Hungary

Ph.D. Thesis

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Abbreviations

BM	The Burnout Measure
PSS	Psychosomatic Symptom Scale
BI	Burnout Index
PLS	Partial Least Squares regression
SBMI	Shortened Burnout Measure Index
SPSS	Shortened Psychosomatic Symptom Scale
WHO	World Health Organization
EE	Emotional exhaustion
PE	Physical exhaustion
ME	Mental exhaustion
PP	Personal accomplishment
DP	Depersonalization
VIP	Variable Importance in Projection

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Summary

Background: Burnout is still one of the leading mental health problems among paramedics. According to research results over the past decades, healthcare workers, including paramedics, are considered a high-risk group. In concordance with these results, the available resources need to prioritize assessing and monitoring paramedics' mental health effectively.

Methods: In Study One, we investigated whether the available test batteries measuring burnout could be reduced while maintaining their effectiveness. We reduced the 21-item Burnout Measurement and the 8-item version of the Psychosomatic Symptom Scale using the data of 727 Hungarian paramedics. We selected the top four items of the questionnaires that were significantly correlated with the original Burnout Measure Index and the Psychosomatic Scale Index. The classification efficiency of the shortened list of items was based on the initial risk categories of the Burnout Measure, and its sensitivity was analyzed using Binary Logistic regression and ROC curves. We then used Two-Step Cluster Analysis to test the ability of the shortened Burnout Measure Index to develop new risk categories. The reliability indicators were also explored. In Study Two, we have aimed to determine how different demographic and behavioral measures are associated with the level of burnout and psychosomatic symptoms. Also, we aimed to determine the patterns in which these variables contribute to burnout syndrome and its' different aspects among the 727 Hungarian paramedics. We have used Partial Least Square regression and Variable Importance in Projection to identify the exact patterns.

Results: In Study One, we have revealed that the Burnout Measurement can be reduced to 4 items with a classification efficiency of 93.5% in determining the level of burnout. The 5-item reduction of the Psychosomatic Symptom Scale can classify subjects to the appropriate intervention level for burnout with an efficiency of 81.6%. The ROC analysis suggests that the shortened questionnaires have an excellent separative ability to discriminate between the initial risk groups. Three new risk categories were also identified as a result of the cluster analysis. In Study Two, we identified the main pattern, in which socio-demographic factors are contributing significantly to burnout such as age, gender, level of education and job description. However, in

different aspects of burnout we found altering patterns of the significant contributors. Age and gender also had a significant contribution to psychosomatic symptoms.

Conclusion: The shortened scales may be proven effective in resource management, which could significantly quicken the assessment of burnout in the future among the paramedics. The abbreviated scale is also suitable for classifying subjects into risk categories. However, further research is needed to see whether the shortened scales can be used as a diagnostic tool. We found several factors associated with the level of burnout syndrome and psychosomatic symptoms among paramedics. Considering these patterns, we might be able to assess and monitor the paramedics easier and more specifically at individual level.

Introduction

Over the past decades, numerous studies aimed to understand and investigate the nature of burnout syndrome. Burnout syndrome is a complex phenomenon, that occurs when an individual is exposed to work stressors that simultaneously affect their mental, psychological, and somatic state as well as their overall performance (Aronsson et al., 2017; Woo et al., 2020). Burnout syndrome unfortunately has reached a relatively high prevalence in the modern society and thus a significant extent as negative cost in economy and public health (Han et al., 2019). Currently the burnout syndrome is not classified or defined as a medical condition, rather it is an occupational phenomenon based on the World Health Organization (WHO), but it is included in the 11th Revision of the International Classification of Diseases (ICD-11). Even though almost all professions are affected differently, it is generally accepted that healthcare workers are at higher risk of the burnout syndrome (Bria et al., n.d.). Regarding the prevalence of burnout among health care workers, different studies reported a various range of it. Abraham et al found that 13.5 – 60% of primary care providers are at risk of burnout (Abraham et al., 2020).Verougstraete and Bateman found in two different studies, that 48-62% of the physicians suffered from burnout syndrome (Bateman & Viana, 2019; Verougstraete & Hachimi Idrissi, 2020). Among nurses, the prevalence of burnout syndrome varies from 15% up to 54% (Khammar et al., 2018; López-López et al., 2019). The literature reports a similar prevalence rate of burnout syndrome among paramedics as well. Reardon and colleagues revealed that 16-56% of paramedic workers suffered from burnout syndrome (Reardon et al., 2020). Miller's work found a similar, 37.1% prevalence rate among emergency ambulance workers in the United Kingdom (Miller, 2021). Thyer and colleagues found that in total 55.9% of the Australian paramedics showed severe burnout symptoms (Thyer et al., 2018a).

It is important to highlight that the exact definition of burnout is still being debated today. The signs of burnout can be described by a combination of three main symptoms: emotional exhaustion (EE), reduced or low personal accomplishment (PA) and depersonalization (DP). In emotional exhaustion, people feel emotionally drained, unable to cope, tired and enervated. The symptoms of emotional exhaustion are fatigue, weariness, weakening as well. The depersonalization is the interpersonal dimension of burnout syndrome which refers to response to detachment and indifference towards the work performance or towards the people who receive

the work. It develops into negative attitudes or behavior, irritability and avoidance towards work or client. Due negative self-esteem reduced personal accomplishment occurs leading to decreased productivity and capabilities. It also results in reduced morale and coping skills. Burnout causes people to disengage from their work, as they experience it as stressful and frustrating, while their performance also decreases. They find it hard to concentrate and their creativity levels drop. Another important consideration is how burnout is distinguished from depression. Although many symptoms overlap between the two conditions, such as fatigue, feelings of dejection and reduced performance, in most cases burnout symptoms are work-related, and the symptoms relieve when work stressors are removed whereas in depression, they are not exclusively work-related. However, burnout can develop into depression and lead to a range of symptoms, such as sleep disturbances, memory, attention and concentration problems, elevated cortisol levels (Bianchi et al., 2017; Edú-valsania et al., 2022; Khammissa et al., 2022).

The question logically arises, whether the symptoms develop simultaneously. To understand the temporality of burnout symptom, three widely accepted models exist. Before detailing the different concepts on how burnout syndrome develops, we might discuss the main different instruments that assess the level of burnout. It might be helpful to understand the different concepts. According to the review of Reardon and colleagues, burnout in paramedics can be summarized from 5 studies based on the Copenhagen Burnout Inventory and the Maslach's Burnout Inventory (Reardon et al., 2020). The Maslach's Burnout Inventory is a self-administered questionnaire, that measures the level of the main burnout symptoms, namely the emotional exhaustion, depersonalization and decreased personal accomplishment. The instrument consists of three sections with 7-7-8 items, and the participants have 7 answer options. Higher scores in the emotional exhaustion and depersonalization combined with lower scores in the personal accomplishment section indicate burnout (Soares et al., 2023).The Copenhagen Burnout Inventory measures the level of burnout from personal, work-related or client-related perspective. The instrument contains 19 items, and participants can answer on a 5-point scale (Kristensen et al., 2005). In order to assess the level of burnout, several other instruments can be used also. The Oldenburg Burnout Inventory assess the aspects of exhaustion and disengagement from work (Demerouti et al., 2003). The Shirom-Melamed Burnout Measure aims to describe the level of physical fatigue and cognitive weariness using 6-6 items with a 7-point frequency scale (Shirom & Melamed, 2006). These instruments assess the physical and

emotional aspects of burnout in slightly different perspectives and consists of many items, which may still be challenging to complete due to unpredictable time management of paramedics. In addition to these questionnaires, it is important to mention another instrument, namely the Burnout Measure (BM) by Pines and Aronson (Malakh-Pines, 1981) which is typically used in Hungary to measure healthcare professionals' burnout (Tamás et al., 2017, 2018). The concept behind the BM was to create an inventory, that is available to use in many occupational fields. The BM determines the level of burnout in three main aspects, namely the emotional, physical, and mental exhaustion. The emotional exhaustion determines the level of helplessness, hopelessness, and entrapment. Items aiming to assess physical exhaustion consists of questions about the energy level, fatigue, and weakness, whilst mental exhaustion assess the negative attitude towards work, one's and life itself'. The BM determines the level of burnout using 21 items (Enzmann et al., 1998).

In order to characterize, how burnout syndrome might develop, Golembiewski and colleagues proposed the phase model in 1986. Based on the Maslach's Burnout Inventory, that assess the three subdomains (depersonalization, personal accomplishment and emotional exhaustion), the patients or participants can be distinguished as either low or high in each subdomain. Thereby 8 phases of burnout can be determined (Figure A.).

	Phases of Burnout							
	I	II	III	IV	V	VI	VII	VIII
Depersonalization	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi
Personal Accomplishment (REV)	Lo	Lo	Hi	Hi	Lo	Lo	Hi	Hi
Emotional Exhaustion	Lo	Lo	Lo	Lo	Hi	Hi	Hi	Hi

Figure A.: Golembiewski's phase model. Based on the scores in each subdomain of Maslach's Burnout Inventory participants can be categorized in 'Low' or 'High'. The distribution of the categories determines in which phase a participant belongs (*Golembiewski et al. (1989)*).

The phase model can characterize the level and composition of burnout validly and reliably. As the phases progress from 1 to 8, so the physical state or job satisfaction gradually worsen. The phase model proposes two possible routes that each characterize a possible course of the burnout. The first is from phase 1-2-4-8, which corresponds to a persistent and accumulating work

stressor. The second one rather considers of an acute one-off outlier life event such as the loss of a loved one. This route consists of the phases 1-5-8 (Burke, 1989). Golembiewski's concept in general stated that first depersonalization occurs, and it is followed by the emotional exhaustion (GOLEMBIEWSKI et al., 1989). In contrast to Golembiewski's model Leiter stated that first people experience emotional exhaust due stressors from work and depersonalization occurs afterward as a helpful coping mechanism dealing with the stressors. Leiter's concept is called the process model (Leiter, 1989). Even though both Golembiewski's and Leiter's concept included reduced personal accomplishment, the role and temporality of this subdomain in burnout development remained debated. On one hand the core factors of burnout are thought to be the emotional exhaustion and depersonalization. On the other hand, reduced personal accomplishment is rather the employee's personality than as a response reaction to a stressful situation. And at last, but not least reduced personal accomplishment develops rather independently from emotional exhaustion and depersonalization (Büssing & Glaser, 2000). Eventually Leiter revised the process model in 1993 (Leiter, 2018).This proposed model was based on the conservation of resources theory, that defined burnout development as a consequence of lost valued resources, if the resources are inadequate to meet or do not yield the anticipated results. The conservation of resources theory lists demands as role ambiguity, role conflict, stressful events, heavy workload and pressure, while does resources as social support, job enhancement possibilities, participation in decision making, autonomy and reinforcement contingencies. The question arises whether demands and resources contribute to the different subdomains of burnout in the path of stress-strain-coping-self-evaluation. In Leiter's revised model demands are strongly related to emotional exhaustion and resources are related to the depersonalization or personal accomplishment subdomains. This model also argued that emotional exhaustion and personal accomplishment develop simultaneously (Lee & Ashforth, 1996). In line with this concept Büssing and colleagues proposed a refined model in which they distinguished work-related and person-related resources. The work-related resources include autonomy, and it has an impact on the work itself, while the person-related resources include coping mechanisms that are more related to the person itself. This four-stage process model also distinguish work stressors and work stress. The work stressors are commonly regulatory problems at work while work stress that includes additional, increased intensity efforts and risky action is a direct outcome of the work stressors. Büssing and colleagues revealed that there is a

significant relation between work stressors and work stress, and between work stress and emotional exhaustion. Based on this they argued that the experienced work stress has a mediating role between work stressors and emotional exhaustion. Regarding the role of autonomy in burnout syndrome they found that it has a negative correlation only with the work stressors (regulation problems at work) thus it has only an indirect effect on emotional exhaustion and depersonalization (Büssing & Glaser, 2000). To depict the four-stage process model see Figure B.

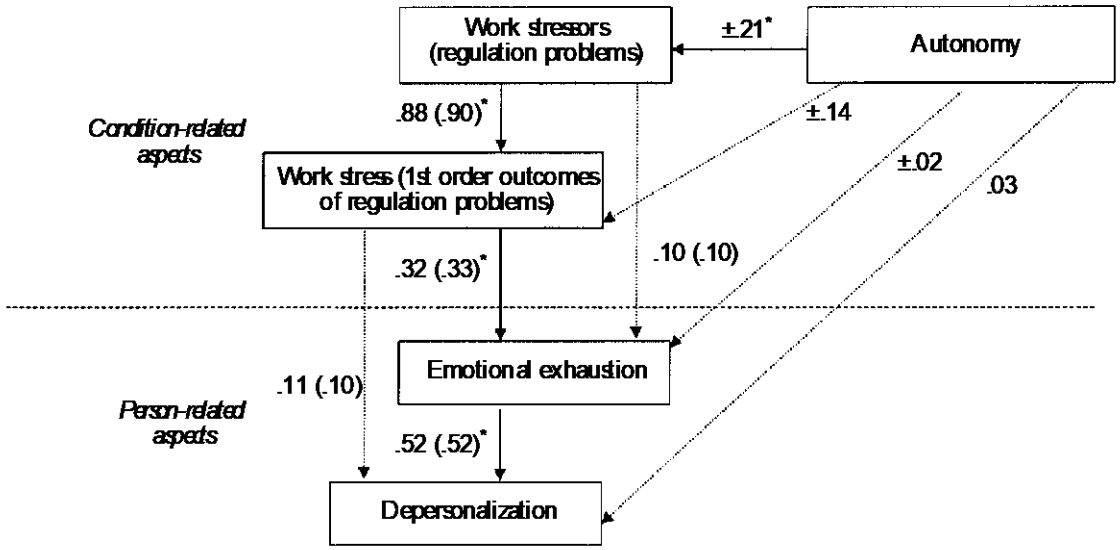

Figure B.: The four-stage process model by Büssing et al. The model distinguishes between resource- and person-related resources and shows the effect of each on burnout subdomains (*: significant relation)(*Büssing et al. (2000)*).

As we summarized the different concepts and models that aim to characterize and detail how burnout syndrome might develop, it is also crucial to discuss which factors contribute or are related to burnout evolvement.

Stepanek and colleagues found that those general practitioners who registered patients above average tended to have higher scores on the Maslach's Burnout Inventory (Štěpánek et al., 2023). Dávid and colleagues revealed higher level of burnout syndrome among healthcare professionals who spent more years in healthcare system, had higher age and performed endoscopic assessment in inflammatory bowel disease patients (Dávid et al., 2023). A study conducted in Nigeria revealed several factors among physicians in tertiary hospitals associated

with the level of burnout. The factors included salary, geopolitical location of practice, religion, apathy toward teaching and academic writing (Oluwadiya et al., 2023). Hopcraft and colleagues revealed that burnout was associated with working in rural location, academic role, higher years in practice and increased alcohol consumption among Australian dentist practitioners (Hopcraft et al., 2023). Rheumatology specialists with younger age, dissatisfaction with the specialty and low income tended to have higher level of burnout (Naim et al., 2024). Perceived lack of support, higher weekly work hours and stuffing shortage was found to be associated with high risk of burnout among almost 4000 anesthesiologists (Afonso et al., 2021). With almost 6000 enrolled oncologist Yates and colleague found that marital status (being single), age (being younger), difficulties outside work (personal life imbalance), workplace stress are all associated with the experienced burnout level (Yates & Samuel, 2019). Molina-Praena and colleagues found that the lack of social and family support, working in night shifts, multiple employment, lack of work-performance recognition and seniority are risk factors in burnout development among nurses (Molina-Praena et al., 2018). Adriaenssens and colleagues in their remarkable work summarized 25 years of research in the topic of burnout to determine the factors associated with burnout syndrome. As individual demographic factors they found that younger age, gender (even though it is still debated), higher level of education; as personality characteristics (neuroticism, extraversion, agreeableness, openness, and conscientiousness), less involvement in daily activities, lower sense of control over events were associated with burnout. The lack of flexibility, stubbornness, judgmental behavior, low level of commitment and perceived control also related negatively with the level of burnout. Regarding the different coping strategies, they found that the active problem focused coping mechanism negatively, while passive avoidant and emotional coping mechanisms were positively associated with burnout. Regarding job attitudes, as the last individual factor, they revealed that higher expectations and goal settings might lead to higher level of emotional exhaust and depersonalization. The other focus of their work discussed which work related factors contribute or predict burnout. They found that repetitive professional exposure to traumatic events, work/time pressure, excessive work load, low level of job control, lack of social support, dissatisfaction with the work environment, not working in team, interpersonal conflicts at job sites, low quality of communication at organizational level and other stuffing insufficiencies such as low quality of the stuff, work scheduling, understaffing,

lack of material resources and low organizational culture are all associated with the level of experienced burnout (Adriaenssens et al., 2015).

In the past three decades numerous studies investigated how burnout develops, which factors are associated or predict the level of burnout in many occupational areas around the globe. The last, but an equally important question that we need to address, how burnout syndrome can be treated and what kind of prevention strategies exist. But first we must detail what consequences burnout syndrome causes to understand better the concept behind prevention or treatment. As psychological consequences the literature lists concentration and memory difficulties, difficult decision making, anxiety, depression, low self-esteem, insomnia, irritability, increased tobacco, and alcohol consumption, and even suicide thoughts (Edú-valsania et al., 2022). As physical consequences hypercholesterolemia, type 2 diabetes, coronary heart disease, hospitalization due to cardiovascular disorder, musculoskeletal pain, changes in pain experiences, prolonged fatigue, headaches, gastrointestinal issues, respiratory problems, severe injuries, and mortality below the age of 45 years are the most common symptoms that evolves during burnout syndrome (Salvagioni et al., 2017). The developed behavioral consequences include job dissatisfaction, low commitment towards work possibly followed by overcommitment towards it, increased absenteeism, perfectionism, prolonged worrying and rumination (Almén, 2021; Edú-valsania et al., 2022). The literature distinguishes between primary, secondary, and tertiary prevention. Primary prevention operates on the organizational level monitoring every employee whilst secondary prevention aims the people who already suffer from the symptoms of burnout syndrome. Secondary prevention helps the affected people to elaborate a proper coping mechanism to prevent the worsening of burnout syndrome. Tertiary prevention focuses on the patients who have already severe burnout and aims to reduce the more severe symptoms (Edú-valsania et al., 2022).Prevention methods either at organizational or personal level are summarized in *Table A.*

Promoted by the Organization		**Promoted by the Worker**	
Aimed at the Structure	**Aimed at Employees**	**Aimed at Oneself**	**Aimed at Aspects of the Job**
Improvement of contents and workstations	Training	Physical exercise	Time management

Promoted by the Organization		**Promoted by the Worker**	
Aimed at the Structure	**Aimed at Employees**	**Aimed at Oneself**	**Aimed at Aspects of the Job**
Humanization of work schedules and implementation of work–life balance plans	Strengths-based interventions	Mindfulness training	Job crafting
Managers' leadership development	Coaching and guidance	Self-assessment	
Use of non-financial rewards and incentives	Creation of support groups	Psychotherapy	
Development of welcome programs			
Burnout monitoring and design of tailor-made plans			
Institutionalization of the Occupational Health and Safety Service			

Table A.: Shows the different aspects of burnout prevention. *(Edú-Valsania et al. (2022)).*

Objectives

In Study One we investigated the degree of burnout among paramedics and how it differs from the original values in published in screening tools. Additionally, we aimed to reduce the length of the questionnaires used in Hungary for measurement of burnout and psychosomatic symptoms, while maintaining their high efficiency. We hypothesize that there are items in the surveys we use that allow for shortening, optimizing the measurement of burnout.

In Study Two we examined the interaction of demographic and work-related factors contributing to burnout and psychosomatic symptom severity. Even though numerous factors were already shown to be associated with symptom severity separately, we hypothesize that the exact pattern of these factors can be identified.

Methods

Participants

In Study One and Study Two, 815 paramedics were enrolled from the National Ambulance Service of Hungary as well (mean age: 40.02, male/female ration: 87.6% / 12.4%). Data were acquired as a final phase of a longitudinal study, conducted between 2016 and 2021 in Hungary. It is important to mention, that the researchers did not have an exact control over the response process.

In both study, batteries were sampled online via Google Survey and paper based as well. Even though no control over the response process were carried out; by completing and submission the questionnaires, the subjects consented to the study in accordance with the Declaration of Helsinki. Both studies were approved by the Regional Medical and Research Ethical Committee of the University of Szeged (No.: 29640). Both samples consisted of people aged 18 or over, and all the participants were full-time employees of the National Ambulance Service of Hungary.

Screening tools

Beside sociodemographic questions, in both studies The Burnout Measure (BM) and Psychosomatic Symptom Scale (PSS) questionnaires were used. The sociodemographic questions consisted of factors as follows: age, gender, highest level of education (primary education, high school education or university), status within the paramedic workforce, years in of work, marital status, shifts, side jobs.

To assess the level of burnout, The Burnout Measure (Malakh-Pines, 1981) was used, that is originally developed by Pines and Aronson back in 1981. The questionnaire focuses on items identified in previous research on burnout syndrome. Each item was scored on a seven-point Likert scale (1=never, 2=once or twice, 3=rarely, 4=sometimes, 5=often, 6=usually 7=always), rating symptoms that have occurred in the past 12 months. Answers were then categorized the following way: between 1-2 points state of constant euphoria; between 2-3 points no intervention needed; between 3-4 points need for change; above 4 points requires

intervention. After calculating burnout score (after recoding the positively phrased items), emotional (items 2, 5, 8, 12, 14, 17,21), mental (items 3, 6, 9, 11, 15, 18, 19), and physical exhaustion (items 1, 4, 7, 10, 13, 16, 20) rates were calculated using the listed items in the brackets.

To determine the level of the somatic background of burnout, the Hungarian-validated version of the Psychosomatic Symptom Scale was used. Each symptom is scored on a scale from 0 to 3 (0=never, 1=rarely, 2=occasionally, and 3=often). According to the original validation in a standard sample, from a total of 21 points, women scored an average of 6.1 points and men 5.0 points (Pik et al., 1997).

Statistical analysis

In Study One, data were analyzed using the Statistical Package for Social Sciences (SPSS 25.0 for Windows, IBM Corporation, USA), and the significance level was set at 0.05. We used descriptive statistics to determine the characteristics of the sample. First, the normality was tested in all variables using the Shapiro-Wilk test. Due to non-normal distributions, non-parametric tests were performed. Reliability was determined by calculating Cronbach's alpha. Mann-Whitney, Kruskal-Wallis and Chi-squared tests were used for between-group comparisons. During the analysis, we first filtered for the role in the paramedic workforce, excluding respondents who gave the status 'OTHER'. We then examined the reliability of the questionnaires taken. In this case, we only went further in the analysis if Cronbach's alpha indicators were adequate. We then calculated the Burnout Index (BI) of BM to determine the degree of burnout by summing up the 21 items, after recoding the positively phrased items (Enzmann et al., 1998; Malakh-Pines, 1981). Finally, we categorized the participants into predefined categories in the questionnaire (Tamás et al., 2017, 2018). While the original instrument discriminates four categories, we only distinguished between low-risk (0-3 points) and high-risk (above 3 points) groups. We then determined which of the items of BM and PSS correlated best with the BI. The methodological consideration was to find the most relevant and well-differentiating items. The two questionnaires contain 29 items (BM: 21; PSS: 8) that we correlated with the BI using Spearman correlation (Howard & Forehand, 1962). The results were ranked according to Spearman's rho, and the 5-5 items considered the most significant are used

as one of the bases for the subsequent analysis. The classification reliability of the selected items was later tested by binary logistic regression (using “enter” and “forward conditional” methods) between the two risk groups. In choosing the most optimal model, we considered the number of items and the percentage of correct classification. On this basis, we determined the most effective model, defined as the ratio of the classification percentage and the number of items. Here, the model with the highest index was chosen for further analysis. Based on the elements of the selected model, a shortened burnout index (SBMI) was created, and its correlation with the BI was examined. Subsequently, we also determined Cronbach’s alpha and sensitivity (ROC analysis) of the SBMI. Then we used Two-Step cluster analysis (automatic, BIC model) to examine the characteristics of the categories created by the SBMI. The cut-off scores for the categories were determined using the Youden Index, calculated using the formula: [(Sensitivity+Specificity)-1] (Habibzadeh et al., 2016). If no psychosomatic complaints appear within the most effective model, it is abbreviated separately and appended to the items that primarily examine burnout.

In Study Two, we have used partial least squares (PLS) regression to examine how different sociodemographic and work-related factors contribute to the degree of burnout (total burnout score, emotional exhaustion, physical exhaustion and mental exhaustion aspects, separately) and to the degree of psychosomatic symptoms in the Hungarian paramedics. In this framework, the outcome variables are represented by an $n \times q$ matrix Y, and the predictors by an $n \times p$matrix X, with n being the number of subjects. PLS iteratively extracts latent variables from both X and Y in a way that maximizes the covariance between them. This procedure reduces the dimensionality of the predictor space by constructing weighted linear combinations of the X variables that form orthogonal components optimized for predicting Y. Formally, the decomposition is expressed as:

$$X=TP^{\top}+E,\ Y=UQ^{\top}+F,$$

where T ($n \times r$) and U ($n \times r$) are the score matrices, P ($p \times r$) and Q ($q \times r$) are the loading matrices, E and F are the residual terms, and r is the number of latent variables. The method ensures that the covariance between the score matrices T and U is maximized. To assess statistical significance, permutation testing was performed on the singular values of the decomposition. Specifically, the rows of the dependent variable matrix were randomly permuted

5,000 times, and the singular values recalculated to generate a null distribution. Variable contributions were summarized using Variable Importance in the Projection (VIP) scores. Since the mean of the squared VIP scores equals 1, variables with VIP values greater than 1 were considered to be of high importance(Abdi & Williams, 2013; Wold et al., 1993).

RESULTS

Sample characteristics

The questionnaire was completed by a total *N*=727 respondents from the 815 total respondents after pre-screening. A total of 637 men and 90 women remained in the sample. Age mean of the total sample was 40.02 years, 40.77 years for men and 34.69 years for women. Most of the respondents (62,17%) had completed secondary school education. The BI has a median of 2.33 points, with 2.33 points for men and 2.35 points for women. The sample was homogeneous in this respect, with no significant difference according to the Mann-Whitney test performed (Z=-1.292, U=26255.0, *p*=.196). For PSS, the average score was 9.04, 8.88 for men and 1.14 for women. These scores were significantly higher than the mean scores of the originally validated test. In addition, the correlation between the burnout index and the psychosomatic index was found to be strong (rho=.735; *p*<.0001) (*For sample characteristics, see Table 1.).*

	N	**Minimum**	**Maximum**	**Mean (Median)**	**SD**	**Test of normality *(p)***
Age	727	19.00	64.00	40.02 (40.00)	10.22	<.0001
Years of Work	727	0.15	45.00	14.77 (12.00)	11.10	<.0001
BM Index	727	1.00	7.00	2.70 (2.33)	1.20	<.0001
PSS Index	727	0.00	24.00	9.04 (9.00)	4.90	<.0001

Sex		**Education**		
Male	Female	Primary education	Secondary education	Higher education

N	637	90	28	452	247
Percentage (%)	85.88	14.12	3.85	62.17	33.98
	Marital State				
	Single	In a relationship	Married	Divorced	Widow
N	88	234	438	53	2
Percentage (%)	10,8	28,7	53,7	6,5	0,2
	Job Title				
		Emergency physician	Paramedic officer	Emergency nurse	Ambulance driver
N		40	173	343	171
Percentage (%)		5,5	23,8	47,2	23,5

Table 1.: Descriptive statistics of the sample. *Results show that the main characteristics do not meet the criteria of normal distribution.*

Results in Study One

Before correlation analysis, we first examined the normality and reliability of each item in the questionnaire. The BM had a Cronbach's alpha of 0.813, and the PSS had a Cronbach's alpha of 0.898. Without exception, the items deviated from the normal distribution. Subsequent tests revealed that the following five items were found to be the most significantly correlated with the BI: being emotionally exhausted (rho=0.833, $p<0.001$); being 'wiped out' (rho=0.831, $p<0.001$); feeling rundown (rho=0.822, $p<0.001$); feeling hopeless (rho=0.777, $p<0.001$); feeling 'burned out' (rho=0.766, $p<0.001$). The Cronbach's alpha coefficients for the selected five items were re-examined and were found to be 0.920, meaning high reliability. The items of the PSS also showed a correlation with BI: feeling weak and tired (rho=0.649, $p<0.001$); sleeping problems (rho=0.595, $p<0.001$); stress diarrhea (rho=0.490, $p<0.001$); palpitation (rho=0.461,

p<0.001); backache (rho=0.439, p<0.001). For somatic problems, Cronbach's alpha was 0.748, assuming good reliability. The psychological and somatic items were combined, giving a total of 10 items, and then the reliability indicators were re-tested here, with a value of 0.901.

Binary logistic regression was used to test the predictive accuracy of the selected items between the low and high-risk groups. First, the five BM items were examined from the point of view of classification. Using the Enter method, efficacy was found to be 93.8% with a significant model (χ2 (df 5, Ntotal: 727, low-risk group: 466, high-risk group: 216) = 708.576 *p*<.0001). Applying the forward conditional method, the efficiency was 93.5%, and one item (*Feeling 'burned out'*) was not required in the model (χ2 (df 4, Ntotal: 727, low-risk group: 465, high-risk group: 215) = 705,173 *p*<.0001). For PPS, using the enter method, an accuracy of 81.6% is obtained (χ2 (df 5, Ntotal: 727, low-risk group: 436, high-risk group: 157) = 334,401 p<. 001), also for the forward conditional method (χ2 (df 5, Ntotal: 727, low-risk group: 436, high-risk group: 157) = 334,401 p<.0001). In the case of 10 items, using the enter method, we obtained an accuracy of 94.5% (χ2 (df 10, Ntotal: 727, low-risk group: 469, high-risk group: 218) = 731,359 p<. 001), while the forward conditional method yielded 93.9% (χ2 (df 10, Ntotal: 727, low-risk group: 464, high-risk group: 219) = 726,346 p<.0001). Therefore, the four-batch BM model seems to be the optimal choice based on the given ratio. Combining the four items created a new burnout index for further analysis (SBMI). The shortened English and Hungarian version of the questionnaire is below:

Shortened Burnout Scale for Paramedics (ENG)

How often have you experienced the following symptoms in the last 12 months? Use the scale below! 1=never, 2=once or twice, 3=rarely, 4=sometimes, 5=often, 6=usually, 7=always.							
	1	**2**	**3**	**4**	**5**	**6**	**7**
Being emotionally exhausted							
Being 'wiped out'							
Feeling rundown							
Feeling hopeless							

Categories:
Over 17 points: High risk
Between 10-17 points: Moderate risk
Between 0-9 points: Low risk

Mentősök kiégettségi szintjének rövidített verziója (HUN)

Milyen gyakran érezte a következő tüneteket az elmúlt 12 hónapban? Használja az alábbi skálát! 1=soha, 2=egyszer vagy kétszer, 3=ritkán, 4=néha, 5=gyakran, 6=általában, 7=mindig.							
	1	**2**	**3**	**4**	**5**	**6**	**7**
Érzelmileg kimerült							
Úgy érzi felmorzsolták							
Elkopottnak érzi magát							
Reménytelenség érzése							

Kategóriák:
17 pont felett: Magas rizikó
10-17 pont között: Moderált rizikó
0-9 pont között: Alacsony rizikó

The Cronbach's alpha for the four selected items was excellent (0.905) and correlated well with the BM (rho=0.936) and PSS (rho=0.683). The ROC curve was calculated to confirm the sensitivity and specificity tradeoff further. The analysis also shows that SBMI has an excellent separation ability concerning the assessment of the original risk groups (AUC_{SBMI} =. 979; 95% CI: 0.971 - 0.988) (For ROC curves, see Figure 1).

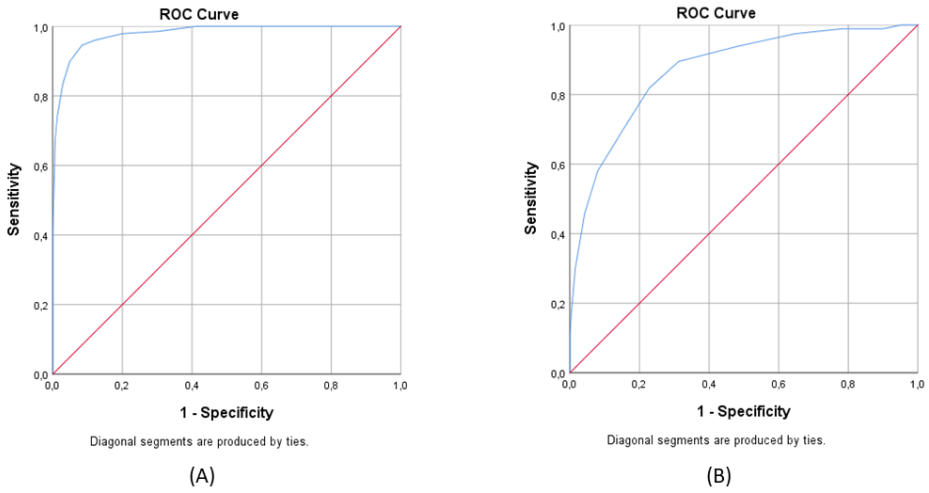

Figure 1.: Results of the ROC curves. *Comparing SBMI (A) and SPSSI (B), the results show that SBMI has an excellent level of sensitivity and specificity (AUC_{SBMI}=0.979), while SPSSI (AUC_{SPSSI}=0.871) also obtained good markers.*

We also examined whether the SBMI can distinguish between different risk groups. Using the Two-Step clustering method (BIC, automatically determined clusters), we obtained three well-distinguishable groups [High risk (M=21.18, SD=2.91); Moderate risk (M=13.42, SD=2.19); Low risk (M=5.81, SD=1.72)] *(For cluster characteristics see Figure 2 and Table 2).*

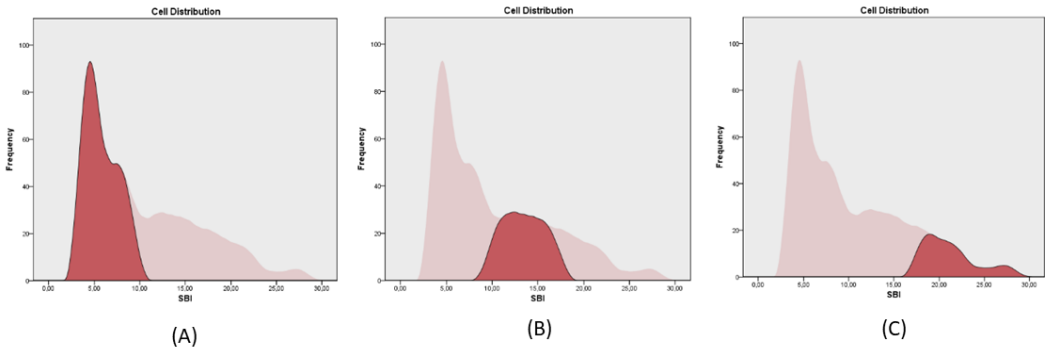

Figure 2.: Results of the cluster analysis. *Using SBMI, three risk categories were identified (A) low risk; (B) medium risk; (C) high risk. The resulting clusters have good separation indicators.*

	Low Risk		Moderate Risk		High Risk		
	(n)	Mean (SD)	(n)	Mean (SD)	(n)	Mean (SD)	Group differences *(p)*
Age	400	40.02 (10.32)	206	39.84 (10.34)	114	40.30 (9.66)	.919
Years of Work	400	14.12 (11.42)	206	15.30 (10.95)	114	16.10 (10.08)	.021
BM Index	400	1.85 (.42)	206	3.24 (.54)	114	4.84 (.73)	<.0001
PSS Index	400	6.46 (3.64)	206	11.00 (3.51)	114	14.75 (4.52)	<.0001
SBM Index	400	5.81 (1.72)	206	13.42 (2.19)	114	21.18 (2.91)	<.0001
SPSS Index	400	4.42 (2.52)	206	7.71 (2.45)	114	10.24 (2.90)	<.0001
Sex (n) (Male/ Female)	358/49		182/24		97/17		.675
Education (n) (Primary/ Secondary/ Higher)	15/213/139		10/128/68		3/71/40		.890

Table 2.: Descriptive statistics of the clusters based on SBMI.

For the low and moderate risk and the moderate and high-risk categories, the most optimal cut-off values would be 9.5 and 17.5 points respectively, but the test results are calculated with whole points. Thus, the Youden-index of the two closest integer scores *Howard et al. (1962)*) was determined, and the score with the better indicator was chosen as the cut-off value (J_{10}=0.704 vs J_9=0.679; J_{18}=0.964 J_{17}=0.798).Since the items of PSS did not appear in the current model, the selected five items were used to differentiate burnout levels. In this case, we

also examined Cronbach's alpha values of the shortened PSS index (SPSSI) (0.748) and the correlation between BI (rho=0.744) and SBMI (rho=0.698). Furthermore, the ROC analysis results show that SPSSI has good sensitivity and specificity (AUC_{SPSSI} =0. 871; 95% CI: 0.845 - 0.897).

Results in Study Two

In the first PLS analysis, the dependent variables were the total burnout score, the rate of emotional, mental and physical exhaustion. As the second latent variable interpreted only a small part of the variance of the dependent measure (<5%) and the permutation test indicated a non-significant latent variable, only the first latent variable was evaluated. The permutation test showed that the first latent variable was significant ($p < 0.001$) and responsible for 34.6% of the variation of the dependent variable. The *X* loadings and the corresponding VIP scores in regard of the total burnout score indicated that job description (VIP score: 1.258), level of education (VIP score: 1.225), gender (VIP score: 1.21) and age (VIP score: 1.029) were the significant contributors in ascending order (Figure 3).

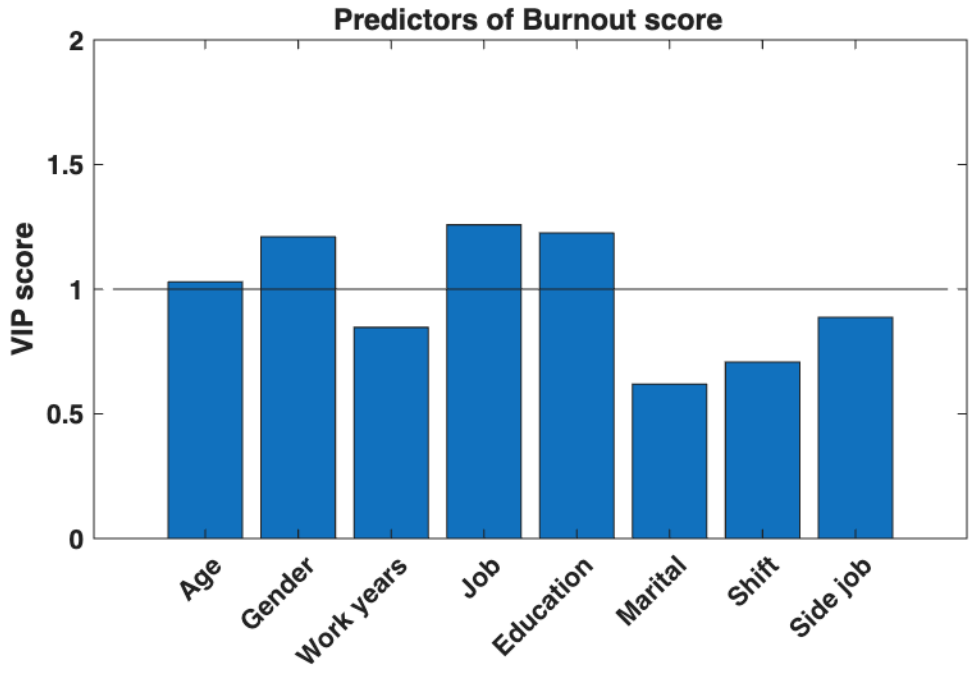

Figure 3.: VIP scores of PLS regression to determine contributors to total burnout score.

Following the PLS regression analysis, descriptive statistics were computed for each significant sociodemographic and work-related predictor of burnout scores (VIP > 1).This allowed for a clearer interpretation of the direction and variability of the observed effects. Beside younger age, physician position, university degree and female gender showed the highest contribution to burnout score among paramedics. The mean and standard deviation of burnout scores for each predictor category are summarized in Table 3. and Figure 4.

Outcome	Predictor	Group/Level	Mean ± SD
Total Burnout score	Job description	Physician	2.88452 ± 1.13391
Total Burnout score	Job description	Med assistant	2.88439 ± 1.03200
Total Burnout score	Job description	Nurse	2.82323 ± 1.03462
Total Burnout score	Job description	Driver	2.65052 ± 1.03360
Total Burnout score	Job description	Other	2.76847 ± 0.98780
Total Burnout score	Education level	Primary	2.86032 ± 1.04253
Total Burnout score	Education level	High school	2.73696 ± 1.02082
Total Burnout score	Education level	University	2.89832 ± 1.05410
Total Burnout score	Gender	Female	2.94325 ± 1.05180
Total Burnout	Gender	Male	2.77191 ± 1.03049

Table 3. Descriptive statistics for significant sociodemographic and work-related predictors of burnout scores identified by partial least squares (PLS) regression.

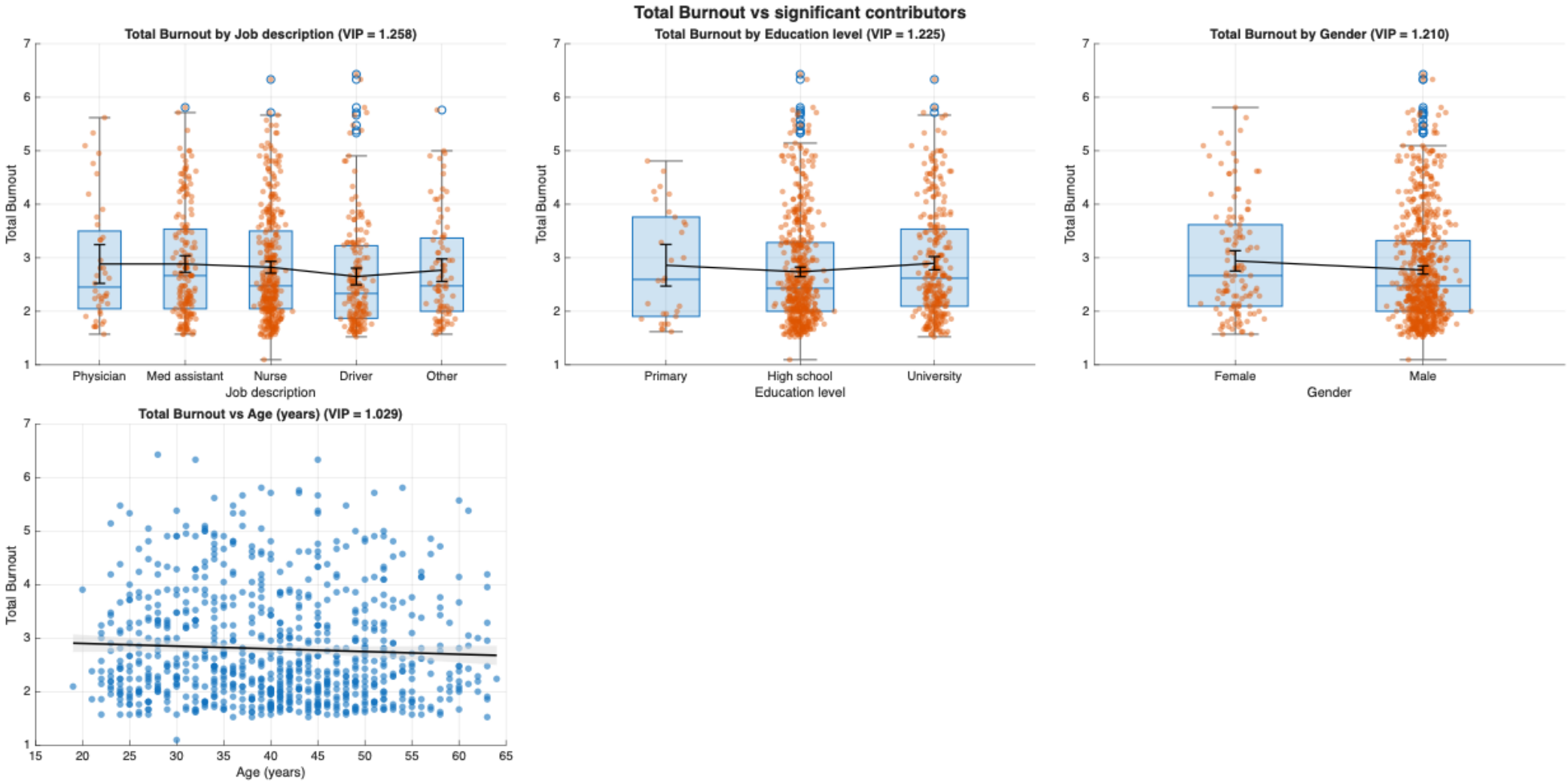

Figure 4. Relationships between socio-demographic and work-related predictors and total burnout score. *Job description, education level, gender, and age showed the strongest contributions (VIP > 1) to overall burnout. Job, education and gender are displayed as categorical boxplots, while age is shown as a continuous scatter with linear fit. Blue bands represent 95% confidence intervals of the fitted regression lines.*

In regards of the physical exhaustion, level of education (VIP score: 1.327), gender (VIP score: 1.308) and job description (VIP score: 1.28) were the significant contributors in ascending order (Figure 5.).

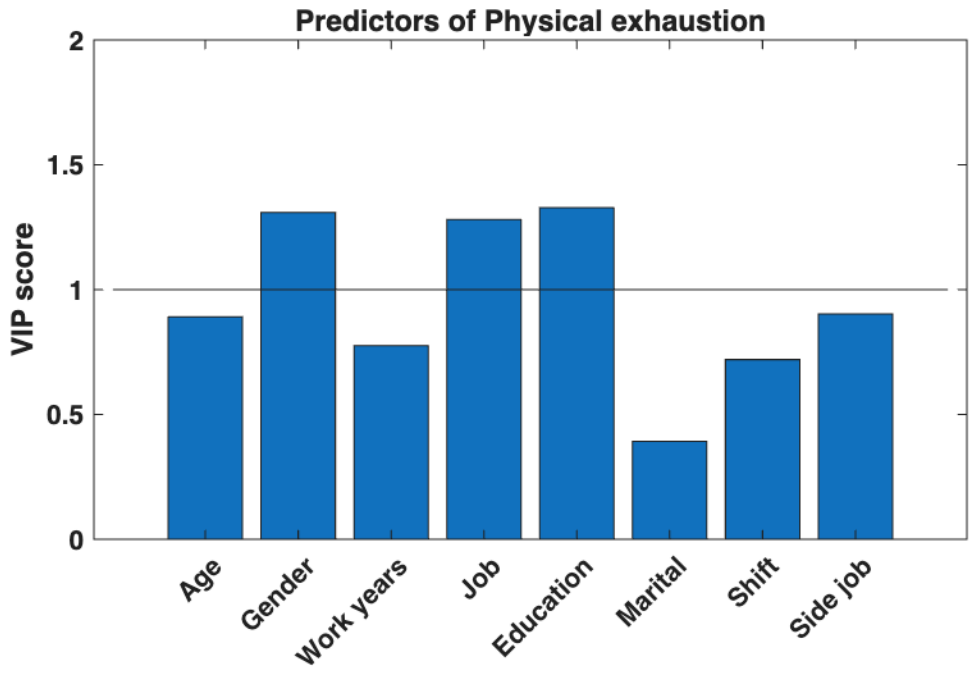

Figure 5.: VIP scores of PLS regression to determine contributors to physical exhaustion.

The descriptive statistics showed that university degree, female gender and physician position showed together showed the highest contribution to the physical exhaustion aspect of burnout syndrome among paramedics. The mean and standard deviation of physical exhaustion aspect of burnout syndrome for each predictor category are summarized in Table 4. and Figure 6.

Outcome	Predictor	Group/Level	Mean ± SD
Physical Exhaustion	Education level	Primary	2.71905 ± 1.23717
Physical Exhaustion	Education level	High school	2.62755 ± 1.24472
Physical Exhaustion	Education level	University	2.85206 ± 1.26363
Physical Exhaustion	Gender	Female	2.92619 ± 1.26832
Physical Exhaustion	Gender	Male	2.67071 ± 1.24850
Physical Exhaustion	Job description	Physician	2.86071 ± 1.44586
Physical Exhaustion	Job description	Med assistant	2.84310 ± 1.23475
Physical Exhaustion	Job description	Nurse	2.72467 ± 1.23665
Physical Exhaustion	Job description	Driver	2.51880 ± 1.25919
Physical Exhaustion	Job description	Other	2.67816 ± 1.23722

Table 4. Descriptive statistics for significant sociodemographic and work-related predictors of physical exhaustion aspect of burnout syndrome identified by partial least squares (PLS) regression.

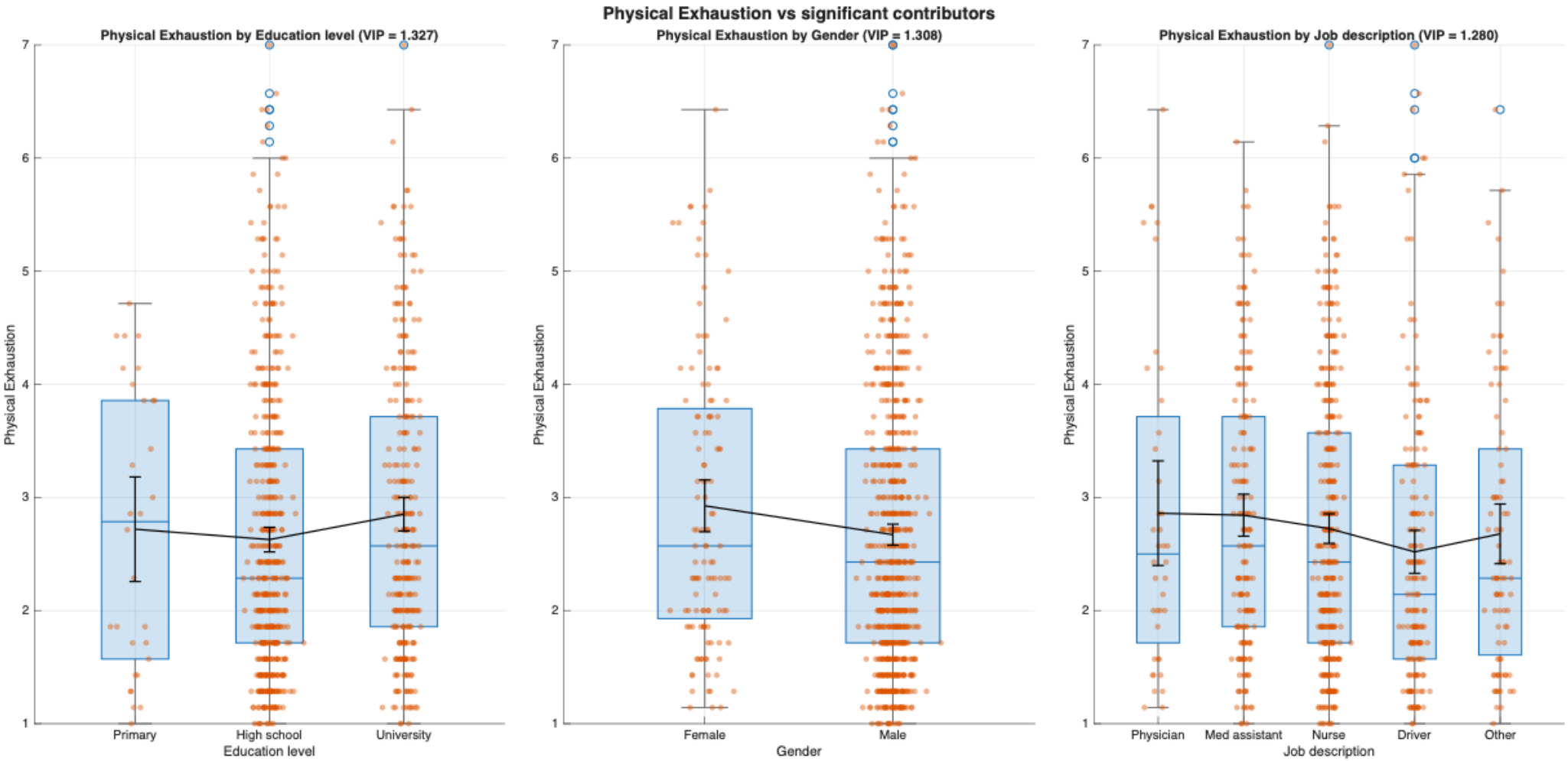

Figure 6. Relationships between socio-demographic and work-related predictors and thephysical exhaustion aspect of burnout syndrome. *Education level, gender and job description showed the strongest contributions (VIP > 1) to overall physical exhaustion. Education level, gender and job description are displayed as categorical boxplots. Blue bands represent 95% confidence intervals of the fitted regression lines.*

However, age (VIP score: 1.37), side job (VIP score: 1.261) and level of education (VIP score: 1.246) contributed most to the level of mental exhaustion aspect of burnout syndrome in ascending order (Figure 7.)

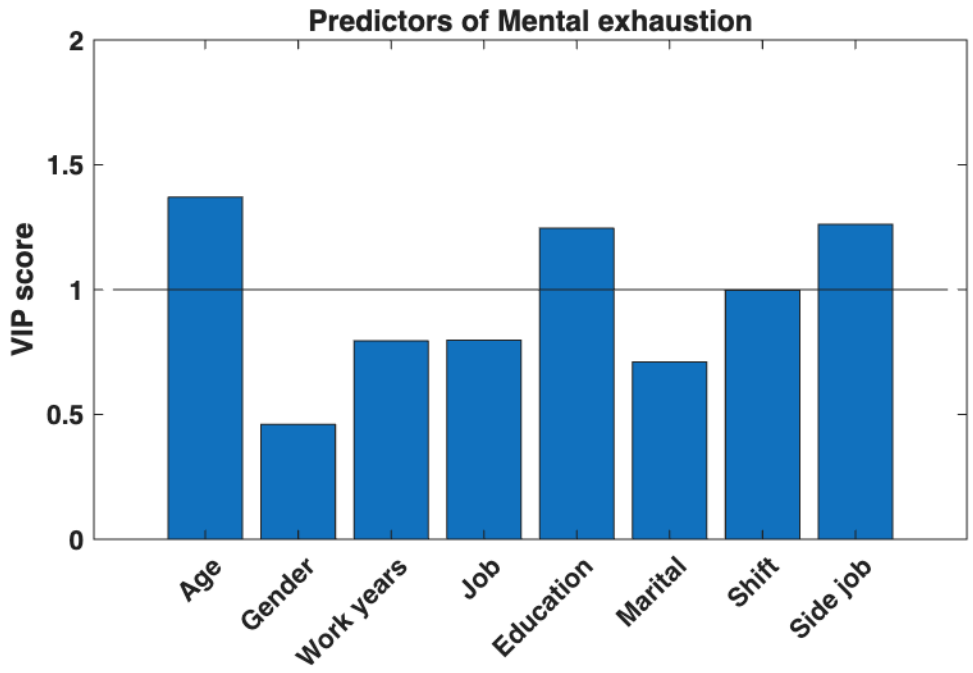

Figure 7.: VIP scores of PLS regression to determine contributors to mental exhaustion.

The descriptive statistics showed that older age, primary education and the presence of side job showed together the highest contribution to the mental exhaustion aspect of burnout syndrome among paramedics. The mean and standard deviation of mental exhaustion aspect of burnout syndrome for each predictor category are summarized in Table 5. and Figure 8.

Outcome	Predictor	Group/Level	Mean ± SD
Mental Exhaustion	Side job	Yes	3.27033 ± 0.73827
Mental Exhaustion	Side job	No	3.21499 ± 0.79472
Mental Exhaustion	Education level	Primary	3.32381 ± 0.85132
Mental Exhaustion	Education level	High school	3.22789 ± 0.75366
Mental Exhaustion	Education level	University	3.30097 ± 0.73959

Table 5. Descriptive statistics for significant sociodemographic and work-related predictors of mental exhaustion aspect of burnout syndrome identified by partial least squares (PLS) regression.

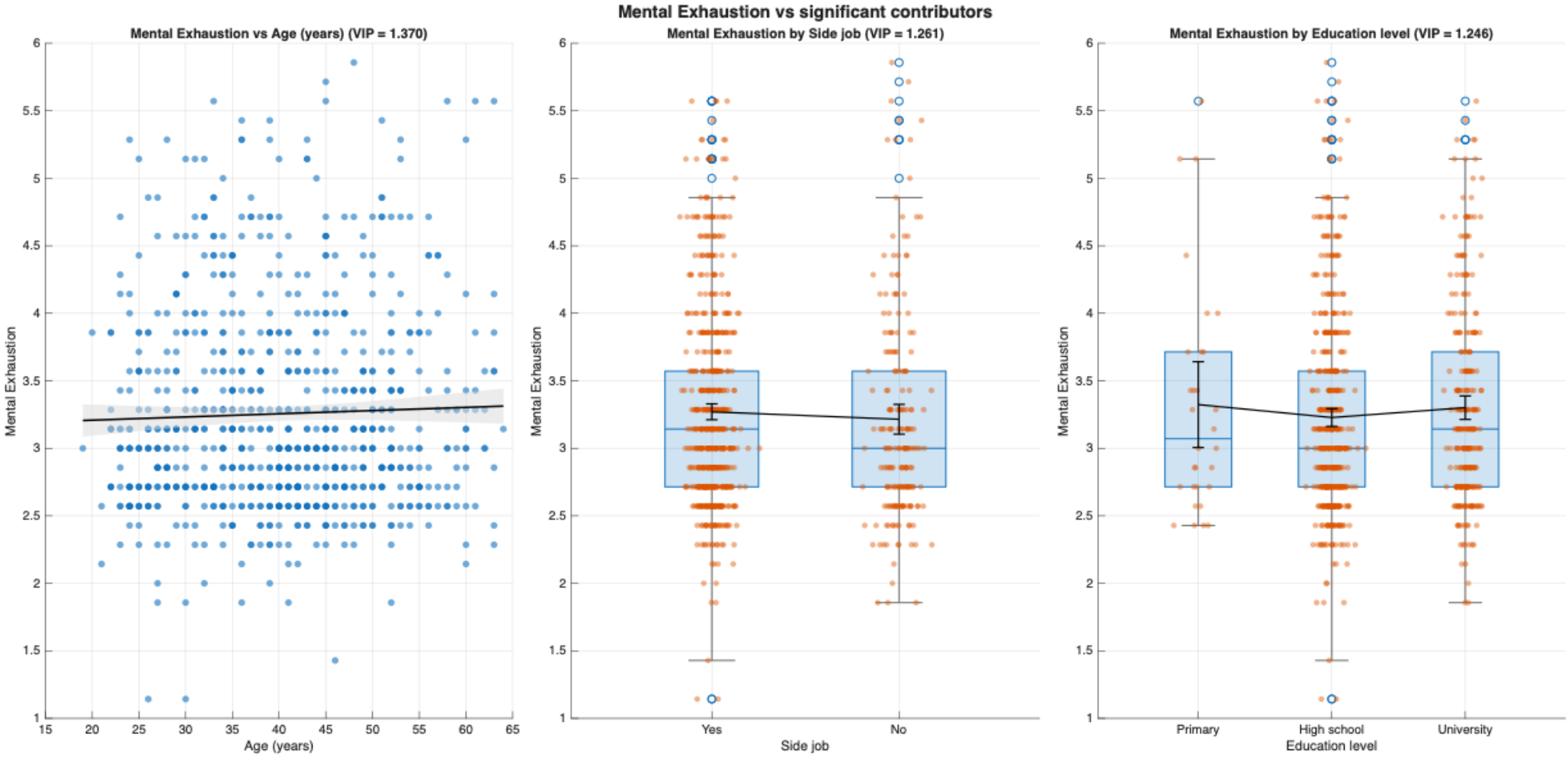

Figure 8. Relationships between socio-demographic and work-related predictors and the mental exhaustion aspect of burnout syndrome. *Age, the presence of side job and the highest education level showed the strongest contributions (VIP > 1) mental exhaustion. Side Job, education are displayed as categorical boxplots, while age is shown as a continuous scatter with linear fit. Blue bands represent 95% confidence intervals of the fitted regression lines.*

Furthermore, contributors of emotional exhaustion were age (VIP score: 1.57), job description (VIP score: 1.213) and gender (VIP score: 1.092) in ascending order (Figure9.).

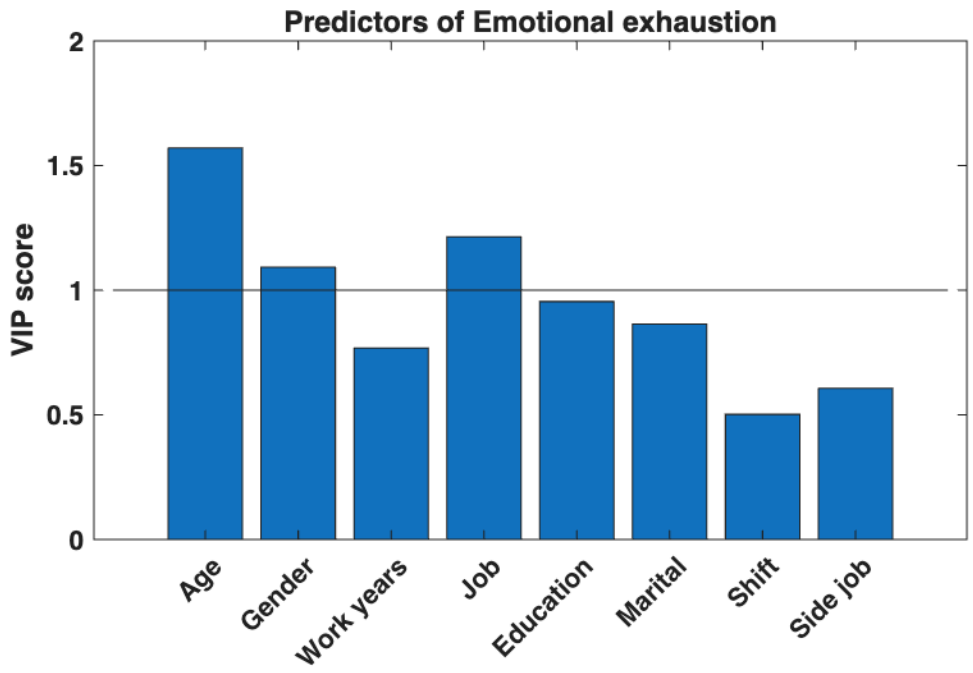

Figure 9.: VIP scores of PLS regression to determine contributors to emotional exhaustion.

The descriptive statistics showed that younger age physician position and female gender showed together the highest contribution to the emotional exhaustion aspect of burnout syndrome among paramedics. The mean and standard deviation of mental exhaustion aspect of burnout syndrome for each predictor category are summarized in Table 6. and Figure 10.

Outcome	Predictor	Group/Level	Mean ± SD
Emotional Exhaustion	Job description	Physician	2.54286 ± 1.41540
Emotional Exhaustion	Job description	Med assistant	2.52766 ± 1.31161
Emotional Exhaustion	Job description	Nurse	2.48214 ± 1.27623
Emotional Exhaustion	Job description	Driver	2.23392 ± 1.26944
Emotional Exhaustion	Job description	Other	2.33005 ± 1.20024
Emotional Exhaustion	Gender	Female	2.62619 ± 1.30645
Emotional Exhaustion	Gender	Male	2.39198 ± 1.27734

Table 6. Descriptive statistics for significant sociodemographic and work-related predictors of emotional exhaustion aspect of burnout syndrome identified by partial least squares (PLS) regression.

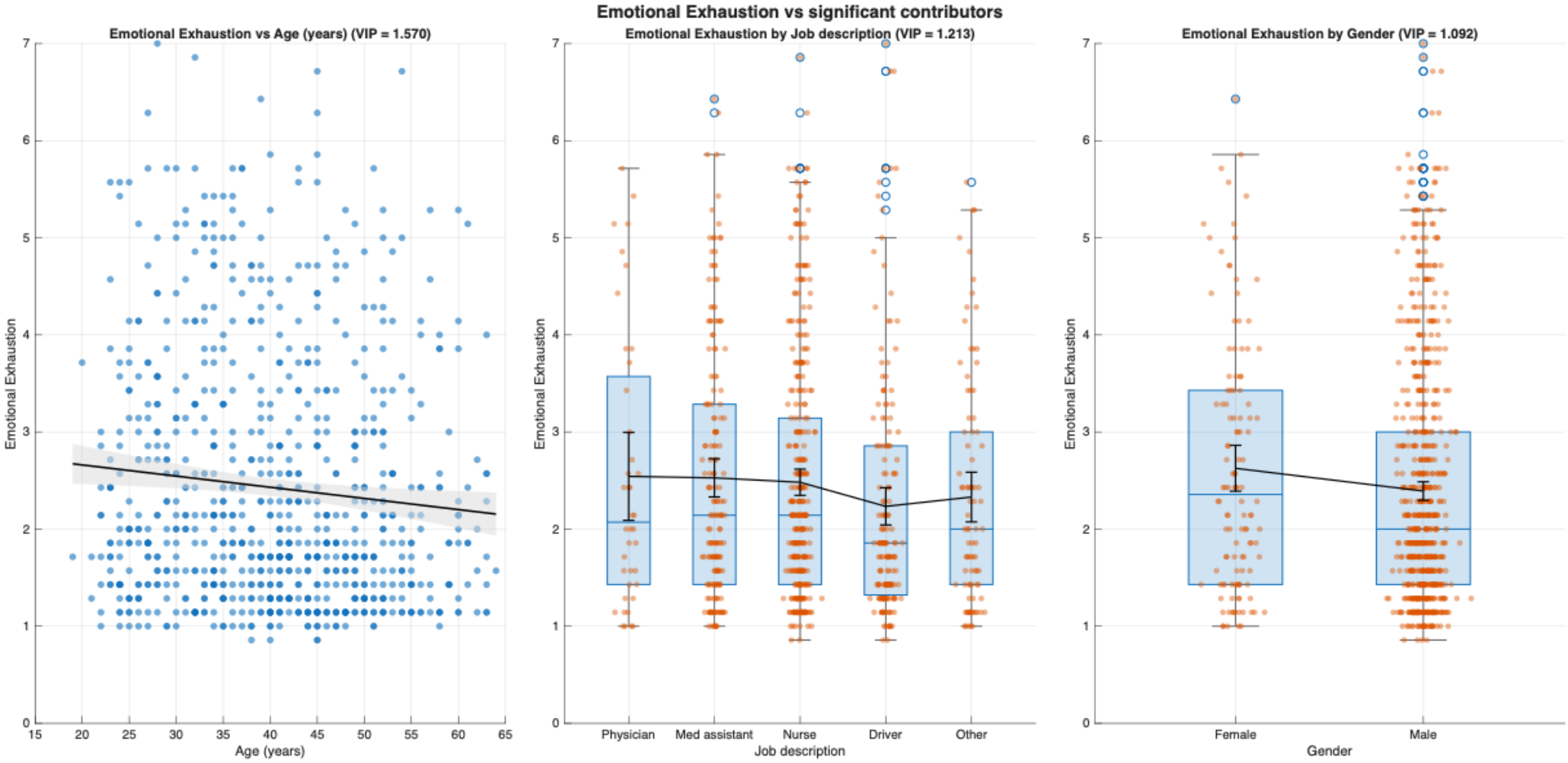

Figure 10. Relationships between socio-demographic and work-related predictors and the emotional exhaustion aspect of burnout syndrome. *Age, job description and gender showed the strongest contributions (VIP > 1) emotional exhaustion. Job description and gender are displayed as categorical boxplots, while age is shown as a continuous scatter with linear fit. Blue bands represent 95% confidence intervals of the fitted regression lines.*

Finally, in the second PLS analysis, the dependent variable was the psychosomatic symptom scale score. As in the first PLS, the second latent variable interpreted only a small part of the variance of the dependent measure (<5%) and the permutation test indicated a non-significant latent variable, only the first latent variable was evaluated here as well. The permutation test showed that the first latent variable was significant ($p < 0.001$) and responsible for 32.41% of the variation of the dependent variable. The *X* loadings and the corresponding VIP scores in regard of the psychosomatic symptom scale scores indicated that only gender (VIP score: 1.739) and age (VIP score: 1.562) were the significant contributors in ascending order (Figure 11.).

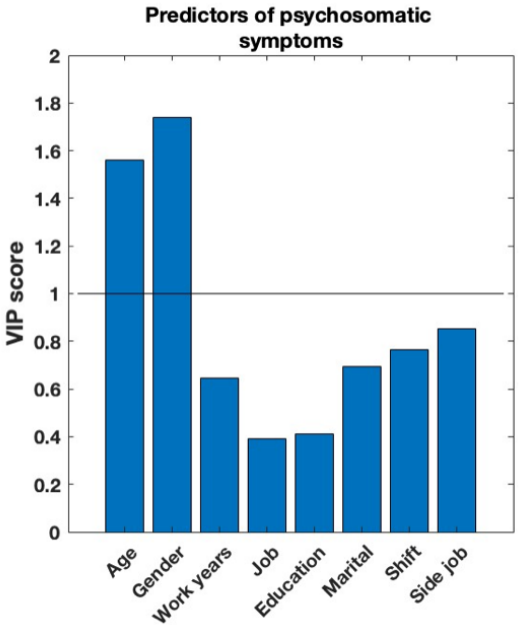

Figure 11.: VIP scores of PLS regression to determine contributors to psychosomatic symptoms of the paramedics

The descriptive statistics showed that younger age and female gender showed together the highest contribution to the psychosomatic symptoms among paramedics. The mean and standard deviation of psychosomatic symptoms for each predictor category are summarized in Table 7. and Figure 12.

Outcome	Predictor	Group/Level	Mean ± SD
Psychosomatic symptom scale (PSS)	Gender	Female	9.82500 ± 4.25384
Psychosomatic symptom scale (PSS)	Gender	Male	8.56259 ± 4.59216

Table 7. Descriptive statistics for significant sociodemographic and work-related predictors of psychosomatic symptoms identified by partial least squares (PLS) regression.

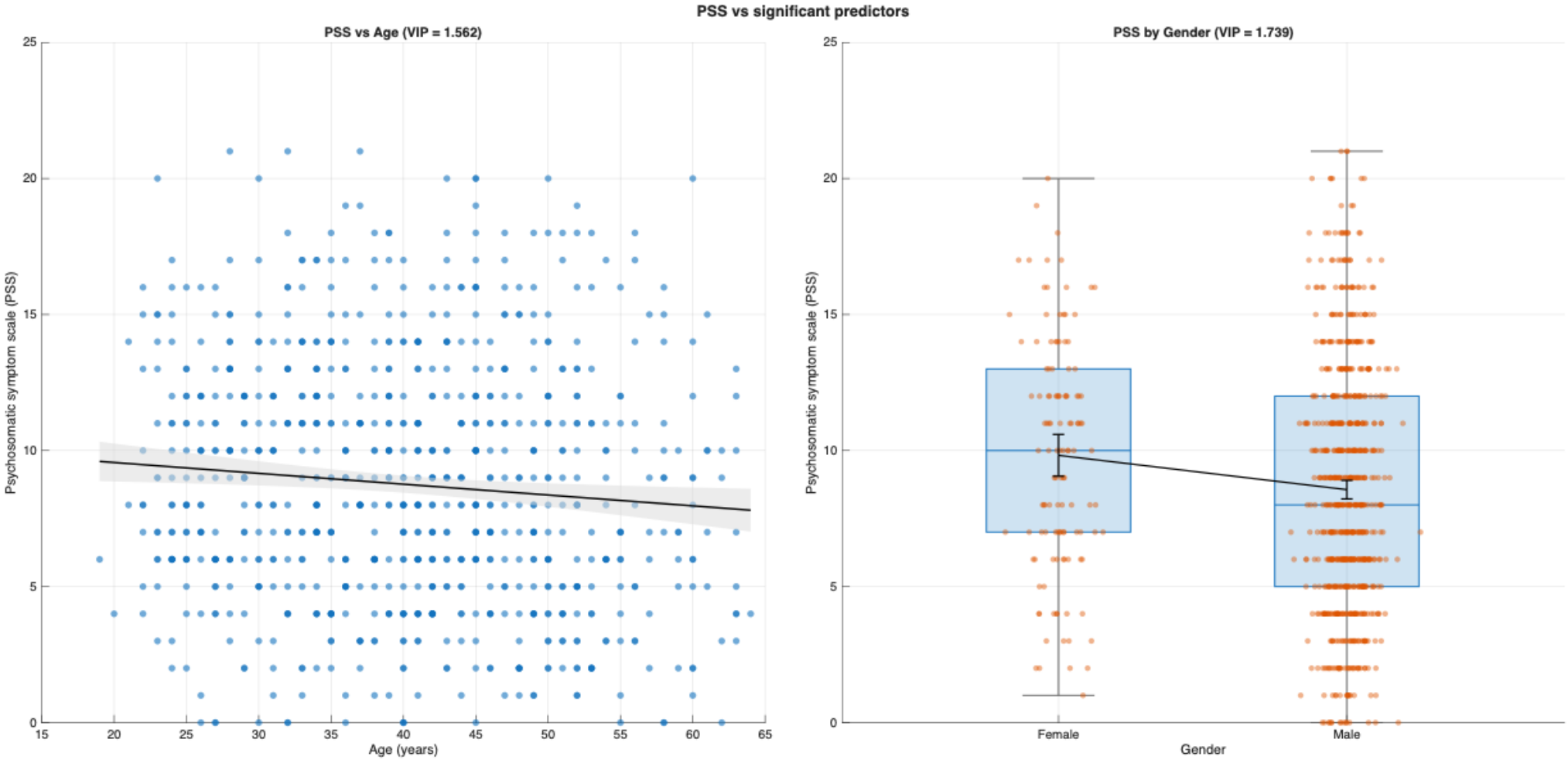

Figure 12. Relationships between socio-demographic and work-related predictors and the psychosomatic symptoms. *Age and gender showed the strongest contributions (VIP > 1) to psychosomatic symptoms. Gender is displayed as categorical boxplots, while age is shown as a continuous scatter with linear fit. Blue bands represent 95% confidence intervals of the fitted regression line.*

Discussion

Enrolling 727 members of the National Ambulance Service of Hungary, in our two studies we aimed to demonstrate that (i) we are able to reduce the length of the questionnaires used in Hungary for measurement of burnout and psychosomatic symptoms, while maintaining their high efficiency (ii) there are items in the surveys we use, that allow for shortening, optimizing the measurement of burnout, thus (iii) with the shortened questionnaire we are able to classify paramedics into well-defined risk categories. Furthermore, we have aimed to demonstrate (iv) using model free approach we could identify patterns in socio-demographic and work-related factors that contribute to the severity of burnout and psychosomatic symptoms.

The most important results of our studies can be summarized as follows:

(1) In Study One we found strong correlation between the burnout and psychosomatic symptoms scores.

(2) In Study One we were able to shorten the original Burnout Measure questionnaire to a new Shortened Burnout Measure Instrument including 4 items from the original Burnout Measure.

(3) In Study One using model free clustering method we could determine three well-distinguishable groups regarding the risk of burnout development. The Shortened Burnout Measure Instrument had excellent separation ability in relation of the risk groups.

(4) In Study One we were able to determine precise cut-off values between the high, medium, and low risk group in relation of burnout.

(5) In Study Two we identified that younger age, physician position, university degree and female gender were the most significant contributors together to the degree of burnout syndrome.

(6) In Study Two we identified that university degree, female gender and physician position were the most significant contributors together to the degree of physical exhaustion aspect of burnout syndrome.

(7) In Study Two we identified that older age, presence of side job and primary education were the most significant contributors together to the degree of mental exhaustion aspect of burnout syndrome.

(8) In Study Two we identified that younger age, physician position and female gender were the most significant contributors together to the degree of emotional exhaustion aspect of burnout syndrome.

To discuss our results, we might first review the literature that investigated the topic of burnout among health care workers in Hungary. Enrolling 76 nurses and 80 physicians Kovács and colleagues found that nurses experienced higher level of emotional exhaustion and depersonalization, whilst physicians tended to score higher on the personal accomplishment subscale of MBI(Kovács et al., 2010).Also using MBI Győrffy and colleagues revealed that 23.5% of the 4784 physicians showed high level of emotional exhaustion, 19% had high level of depersonalization and 39.7% of the participants had high level of low personal accomplishment. They also found that the medium and high level of burnout occurred more frequently among females, whilst medium and high level of depersonalization could be observed among males(Győrffy & Girasek, 2015). Similar results were reported by Ádám and colleagues. They found that depersonalization was higher in male physicians, whilst age was negatively associated with emotional exhaustion and depersonalization. Also, age correlated positively with the personal accomplishment subscale of MBI(Adam et al., 2018). Using Burnout and Burnout Symptomatic Questionnaires Pálfi and colleagues revealed that nurses working in intensive care units have higher level of burnout than nurses working in long term care or active ward(Palfi et al., 2008). Enrolling 201 Hungarian health care staff Pikó found that emotional exhaustion and depersonalization was higher compared to other countries like Canada, USA and Norwegian, and it was strongly associated with job dissatisfaction(Piko, 2006). Sipos and colleagues investigated radiographers in consecutive years and found that the level of burnout was associated with the more years in work, higher work hour, age, working in oncology care and emergency care unit(Sipos et al., 2019, 2020, 2023). Enrolling 581 nurses Cseh and colleagues found higher level of emotional exhaustion and depersonalization compared to normal values(Cseh et al., 2021). Hompoth and colleagues investigated the correlates of burnout and various other factors enrolling emergency care unit workers and found correlation between work years, age, marital status, and the level of depersonalization(Hompoth et al., 2018). Stankovic and colleagues revealed similar relation between the weekly work hours and emotional exhaustion. Interestingly they found that males had higher level of depersonalization than female emergency care workers.

Additionally, they compared the subscales of MBI between emergency and surgery department workers and found that the emergency department's employees had higher level of depersonalization(Stankovic et al., 2019).

In the recent decades a plethora of studies investigated the burnout in different occupations including different health care workers as well. Yet in comparison far fewer study addressed to investigate the burnout among paramedics at least in domestic terms. Braun and colleagues showed that a proportional number of paramedics faced insults during duty and although no gender differences were revealed, older age and exposure to threat correlated with the experienced burnout(Braun et al., 2021). Analyzing the data of 1374 paramedics and 779 emergency medical technicians Crowe and colleagues revealed that paramedics exceeded the emergency medical technicians in the prevalence of personal, work-related and patient-related burnout(Crowe et al., 2018). Similar results were observed in Stassen's work, namely 38% of the paramedics showed work-related, 23% of them showed patient related and 53% of them showed personal burnout(Stassen et al., 2013). On an Australian sample Thyer's work revealed similar prevalence pattern of the work-, patient-related and personal burnout(Thyer et al., 2018). On a large sample of paramedics in Riyadh, Alenazi and colleagues showed that numerous paramedics suffered from personal burnout and that had a positive correlation with the level of experienced stress(Alenazi et al., 2016). Involving ambulance doctors, nurses and drivers Iorga and colleagues found interaction of job satisfaction, work years and alexithymia on burnout level. They result showed higher level of burnout among female paramedics, but no differences were found in relation of profession categories(Iorga et al., 2015). Comparing paramedics working in emergency department or in mobile team Buljan's work showed that those paramedics who worked in a mobile team had higher level of depersonalization(Buljan et al., 2016). Assessing 2361 ambulance driver-rescuers in Italy, Ferraro and colleagues found that low personal accomplishment was with the highest prevalence rate among them, and one third of them was in an intermediate state of burnout. They principal component analysis revealed that empathy and disengagement with patients contributed to the risk of burnout development (Ferraro et al., 2020).Based on our best knowledge beside our work no other Hungarian study addressed the investigation of burnout syndrome and its contributing factors specifically among paramedics. Comparing the results of our second study to the literature, we found that generally, higher education, age, gender, occupation (position) and multiple shifts were associated with the

severity of burnout (Adriaenssens et al., 2015; Afonso et al., 2021; Iorga et al., 2015; Molina-Praena et al., 2018). Even though the literature is divided whether age and gender are associated with the level of burnout syndrome among health care workers, we found both to be associated with it among the paramedics.

However, contrary to literature it has to be emphasized that in our second study we aimed to handle the socio-demographic and work-related factors together in the analysis, not separately correlating with the symptom severity. Using Partial Least Square regression, we were able to distinguish well defined patterns on how these factors in patterns contribute to burnout syndrome and psychosomatic symptoms. In the literature there is only one study can be found using similar approaches. Using Partial Least Squares structural equation modelling de Oliveira and colleagues found that job satisfaction had a casual association with burnout symptoms among hospital workers (De Oliveira et al., 2018). Based on our best knowledge, no study investigated the exact socio-demographic and work-related factor patterns contributing to burnout among paramedics. In our second study we were able to identify these exact patterns in which risk groups could be identified. Higher burnout scores could be observed among those who were physicians, who had university degree, were females and were younger. Females, those who had university degree and physician tended to have higher physical exhaustion. Contrary, those with older age, primary education and having side jobs tended to show higher mental exhaustion. And the last pattern, those with younger age, physician position and female gender showed more expressed emotional exhaustion.

In our first study we aimed to create a shortened version of the Burnout Measure adapted to paramedics working in the National Ambulance Service of Hungary. In order to increase the efficiency of resource management we proposed a reliable, quick and efficiently predictive set of questions in the Shortened Burnout Measure Instrument that allows us to differentiate paramedics based on their level of burnout. Compared to the original questionnaire our shortened version showed that 44% of the paramedics had signs of burnout, whilst 33% was this rate after analyzing the original questionnaire. Combining the psychosomatic complaints with the items of Burnout Measure we aimed to determine the predictor importance of any of the combined questions in relation of burnout and found that the combined items can be reduced to four items with the classification accuracy of 93.5%. Nevertheless, no psychosomatic symptoms were included in the four items. Even though psychosomatic symptoms appear in burnout, the main

problem is primarily psychological and is significantly related to the following factors: being ‘emotionally exhausted; being ‘wiped out’; feeling rundown; feeling hopeless; feeling ‘burned out’(Pérez-Fuentes et al., 2019; Prinz et al., 2012). The strength of the correlation indicates that paramedics in our sample possibly other emotional or mental states first and might not recognize that these are directly related to burnout. These results of Kremer-Hayon and Seidler, namely that emotional exhaustion and rigidity underlie burnout and fundamentally affect the resilience of individuals(Seidler et al., 2014). In addition, it is important to note that people often find it difficult to articulate their psychological burdens or psychosomatic complaint and the latter often are the leading signs of burnout(von Känel et al., 2020). In our first study we were able to shorten the original Burnout Measure questionnaire with good sensitivity and with an accuracy of 81.6% without reducing its’ classification ability. Still, it should also be possible to include psychosomatic symptoms. In the categories created by the shortened version of Burnout Measure, age, gender, education and type of job did not seem to show significant differences, i.e. burnout can occur at any age or gender, regardless of employment and education but psychosomatic complaints are significantly higher in the high-risk burnout groups, and their general health status is perceived to be lower. Our shortened scale has excellent classification properties and could be used as a screening tool among paramedics. In addition, it draws attention to the fact that there are probably distinct stages in the process that allow for more targeted intervention. In case of paramedics, a shortened version of the test battery seems particularly useful, as it is possible to assess their level of burnout after answering four questions. This would allow for the actual treatment of burnout and its prevention. For example, the first step in preventing and managing burnout would be identifying which factors are responsible for developing symptoms in a given group (Rupert et al., 2015). Thus, research has an essential role in helping develop appropriate methods, solutions and strategies, thereby improving the well-being of healthcare workers and the high level of care provided. However, the perception of burnout as a decrease in engagement cannot be determined from these factors; presumably, it may still be more of a mental state close to depression, which does not directly reflect the individual’s attitude. We consider that it may be worthwhile to assess the level of stress on the employee precisely, the level of professional and social recognition, and to further explore links with the level of compensation. A further factor is the emergence of difficulties affecting society in general, such as SARS-CoV-19, which was in an emergent stage in Hungary at the time of

data collection, suggesting that burnout is exacerbated in a health crisis following long-term stress. Furthermore, paramedics leaving the service further reduces the number of staff members on active duty, so the workload is much more concentrated in their case (Paterson et al., 2014).

Conclusion

Based on our studies discussed in this thesis, uniquely in the literature we identified several factor patterns that contribute to burnout syndrome and psychosomatic symptoms among paramedics working in the National Ambulance Service of Hungary. In our first research we have constructed a short questionnaire with a classification efficiency of 81.6% to perform an effective classification even based on physical symptoms. The reliability indicators of the generated inquiries are excellent, and they also show a high correlation with the original questionnaires. These features allow for an efficient and quick self-assessment, convenient for paramedics. Our results in the second research showed that with exact patterns of socio-demographic and work-related factors, we are able to identify paramedics with higher possibility of more severe burnout.

Limitations

Undoubtedly, our two studies that we summarized in this thesis have limitations. In our first study it is important to highlight at least two factors. One is that the results are primarily based on a Hungarian sample, and their interpretation of other countries' healthcare systems requires caution. Furthermore, the study was conducted in the early stages of the SARS-CoV-19 epidemic, which may have already shown signs of a newly emerging burden, and the additional hardships were not compared. In addition, our study did not include psychopathological factors (e.g. depression) that would provide additional information regarding the measurability of this phenomenon. There is also the question of the ecological validity of the shortened questionnaire in terms of whether it measures burnout as effectively as the original 21-item version. There is one more methodological limitation of our second study, namely there were no comparison conducted between the current and most used instruments assessing the level of burnout and our shortened 4-item instrument. In our second study, it has to be highlighted that possibly more socio-demographic and work-related factors should be considered in the analysis pipeline.

Future research

Regarding the results and limitation of our first research, comparing different instruments to our shortened questionnaire could validate the usage of the latter one, thus we might be able to shorten the time of screening and monitoring the paramedics. Also, this would help us to identify faster and more precisely the professionals who are at risk of burnout before severe symptoms develop. Based on the results and limitation of our second research, we could extend the questionnaires with more detailed socio-demographic and work-related instruments, this we might be able to further define the exact contributor factors and patterns to burnout syndrome.

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