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**The Assessment of Occupational Stress and Quality of Life in
Teachers at the 2nd Level of Elementary Schools**

**Hodnocení pracovní psychické zátěže a kvality života
učitelů 2. stupňů základních škol**

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Defence on:

Author's declaration

I declare hereby that this dissertation thesis is my own original work and that I indicated, by references, all used information sources. I also agree with depositing my dissertation in the Medical Library of the Charles University in Prague, Faculty of Medicine and with making use of it for study and educational purpose provided that anyone who will use it for his/her publication or lectures is obliged to refer to or cite my work properly.

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Hradec Králové, June 2014

Šušoliová Olga

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Summary (in Czech language)

Hodnocení pracovní psychické zátěže a kvality života učitelů 2. stupně základních škol

Úvod: Problematika posuzování pracovně psychické zátěže patří ke klíčovým otázkám ochrany veřejného zdraví

Cíl: Hlavním cílem práce bylo zhodnotit pracovní psychickou zátěž u učitelů 2. stupňů základních škol (ZŠ) standardní dotazníkovou metodou s vyšetřením slinného kortizolu. Dalším záměrem bylo zhodnotit kvalitu života (KŽ) učitelů.

Metodika: Provedli jsme anonymní dotazníkové šetření (průřezová studie) u 142 učitelů 2. stupně ZŠ (sledovaný soubor) a 136 hasičů (srovnávací soubor). Míru pracovního stresu jsme hodnotili pomocí Meisterova dotazníku. Subjektivně percipovaný stres jsme následně objektivizovali stanovením slinného kortizolu. Pro posouzení kvality života jsme použili zkrácenou verzi dotazníku WHO QoL- BREF 26.

Výsledky: Naše šetření prokázalo, že učitelé vnímají míru pracovní psychické zátěže hůře než hasiči. Provedená klasifikace psychické zátěže prokázala, že učitelé dosahují stupně 2 (může docházet k dočasnému ovlivnění zdraví), hasiči stupně 1. Vyšetření slinného kortizolu zcela odpovídalo výsledkům zjištěným dotazníkovou metodou. Dosažené diurnální křivky kortizolu (ranní hodnoty, večerní hodnoty, plocha pod křivkou) byly ve všech případech u učitelů signifikantně vyšší než u hasičů, což značí, že učitelé zvládají stres hůře. Kvalita života učitelů ZŠ byla ve všech čtyřech doménách statisticky významně nižší než KŽ hasičů, statisticky se však nelišila od české populační normy.

Závěr: Z naší studie vyplynulo, že učitelé patří mezi profese zvýšeně exponované pracovnímu stresu, a to se všemi negativními dopady na zdravotní stav. Šetření dále prokázalo, že v hygienické praxi standardně používaný Meisterův dotazník je dostatečně validní pro hodnocení pracovní psychické zátěže. Domníváme se však, že vyšetření slinného kortizolu by mělo být pro klasifikaci pracovního stresu využíváno častěji než dosud. Jde o objektivní indikátor reakce organismu na chronický stres, přičemž odběr vzorků slin je jednoduché neinvazivní vyšetření, které je možné provádět v průběhu sledovaného dne včetně pracovní směny. Za nezbytné ovšem považujeme vypracování referenční křivky kortizolu pro pracující českou populaci.

Summary (in English)

The assessment of occupational stress and quality of life in teachers at the 2nd level of elementary schools

Introduction: Problems of the assessment of occupational stress have belonged within one of the key issues of public health protection.

Aim: The main goal was to comprehensively assess the extent of occupational stress and quality of life of teachers at the 2nd level of elementary schools, using salivary cortisol as a possible objective marker. Another aim was to evaluate the quality of life of teachers.

Methods: We performed an anonymous survey (a cross-sectional study) in 142 teachers at the 2nd levels of elementary school (reference group) and 136 firefighters (comparison group). Rate of occupational stress was assessed by using of the Meister Questionnaire. Subjectively perceived stress was subsequently objectified by determining of salivary cortisol. For the evaluating of quality of life, we used shorter version of the questionnaire WHO QoL-BREF 26.

Results: Our investigation showed that teachers perceive the level of their occupational stress was worse than in firefighters. Completed classification of mental overload reached grade 2 (health effects may be temporary), firefighters achieved of grade 1. The examination of salivary cortisol was entirely consistent with the results observed by using questionnaires. The final diurnal cortisol curve (morning and evening values, area under the curve) were in all cases significantly higher than in firefighters, which means worse managing of stress in teachers. Quality of life in teachers in all four domains was also significantly lower than in firefighters, but not statistically different from Czech population norms.

Conclusion: Our study showed that teachers belong to professions increasingly exposed to work- related stress with all negative effects on health. The investigation also demonstrated that the hygienic standard practice used the Meister Questionnaire is sufficiently valid for the evaluation of occupational stress. We assume that examination of salivary cortisol should be for the classification of work – related stress level more common than ever. It is an objective indicator of body's response to chronic stress, where taking of saliva samples is a non-invasive, which can be performed during all monitored day with including of the shift. However, we consider it's necessary to drawn up the reference curve of cortisol for Czech working population

Used abbreviations

ACTH- *adrenocorticotropic hormone*

CAR- *cortisol awakening response*

CBG- *corticosteroid- binding hormone*

CE- *capillary electrophoresis*

CNS- *central nervous system*

DHEA, DHEA - S- *dehydroepiandrosterone, dehydroepiandrosterone- sulfate*

EIA- *enzyme immunoassay*

ELISA- *Enzyme – Linked Immunosorbent Assay*

EU- *the European Union*

HPA- *hypothalamus- pituitary axis*

HRQoL- *Health- Related Quality of Life*

IS-H- *upper confidence interval*

IS-D- *lower confidence interval*

Ln- *natural logarithm*

OSHA- *European Agency for Safety and Health at Work*

QWB - *The Quality of Well-Being Scale*

RIA/IRMA- *radioimmunoassay*

St.D. - *standard deviation*

SPE- *solid phase extraction*

QoL- *Quality of Life*

WHO- *World Health Organisation*

WRS- *work- related stress*

Introduction

The changing working world is making increased demands on workers; downsizing and outsourcing, greater need for flexibility in terms of both function and skills; plentiful temporary contracts, increased job insecurity, higher workloads, more pressure and poor work-life balance are all factors, which contribute to work-related stress (*Takala, 2009*). In the European Union, work-related stress (WRS) is the second most common work-related health problem, after back pain, affecting 28% of EU workers (*Eurofound, 2001*). Stress at work can affect anyone at any level. It can happen in any sector and in any size of organisation or national economies. According to the European Agency for Safety and Health at Work (OSHA), 22% of workers from EU- 27 (in 2005) have suffered with this problem. In 2002, the annual economic cost of work- related stress in the EU-15 was estimated at 20 billion Euros (*European Commission, 2001*). The highest stress levels are observed among middle-aged workers, the lowest among older and younger workers. Little differences between men and women are observed, little more prevalent among men - 23%, compared to women - 20% (*OSHA, 2009*). In 2005, stress was the most commonly occurred in the education and health sectors, agriculture, hunting, forestry and fishing (28.5%). Especially in education sector, teaching is identified as a particularly stressful job (*Smith et al, 2000*). A German study ranked the teaching professions as occupations with the highest risk of poor mental health. Teachers in schools for pupils with disabilities and those engaged in the complementary education of apprentices are regarded as the most at risk (*Hasselhorn and Nübling, 2004*). Thus, in this type of job, work-related stress is often linked to violence, bullying, mobbing, harassment and unacceptable student behaviour (*OSHA, 2009*).

In the Czech Republic, the teachers at elementary schools have been classified within the occupations of increased psychic load based on frequent studies. The job-related activities have significantly changed over the last 10 years, with not only the emphasis being put on the educational part but also with increasing requirements for social interactions (*Židková, 2003*). For some health professionals, questionnaires inquiry is insufficient for work- related stress assessment as this method is usually based on subjective feelings of workers (*Židková, 2002*).

In the *theoretical part of thesis*, in the first chapter, information of occupational stress (definitions of teachers stress especially), psychological principles of work-related stress are stated. The second part includes the review of salivary biomarkers (especially salivary cortisol) and their use in the assessment of occupational stress. The last part deals about description of possible prevention of occupational stress and some definitions of health-related quality of life are presented, too.

1 OCCUPATIONAL STRESS - EPIDEMIOLOGY, OVERVIEWS FROM VARIOUS FIELDS OF STUDY

Occupational stress (optionally work-related stress or workload) is one of the biggest health and safety challenges that we face in Europe. Stress at work can affect anyone at any level. It can occur in any sector and in any size of organisation. Stress affects the health and safety of individuals, but also health of organisations and national economics. The changing world of work is making increased demands on workers through downsizing and outsourcing, the greater need for flexibility in terms of both function and skills, plentiful temporary contracts, increased job insecurity and work intensification (with higher workload and more pressure), and poor work - life balance. The good news is that work-related stress can be dealt with in the same logical and systematic way other health and safety issues. There is amount of practical examples of dealing with it across the EU. With the right approach, workers can be kept from stress. Short-term stress is not usually a problem: indeed, it can help people perform the best of their ability. *Stress becomes a risk to safety and health when it is protracted.*

1.1 Definitions of occupational stress

- *the response which could be presented with work demands and pressures that are not matched to their knowledge and abilities and which challenge their ability to cope;*
- *a wide range of work circumstances, but there are often made worse when employees feel they have little support from supervisors and colleagues, as well as little control over work processes;*
- *confusion between pressure or challenge and stress and sometimes it is used to excuse bad management practice.*

Pressure at a workplace is unavoidable due to the demands of contemporary work environment. Pressure perceived as acceptable by an individual, might keep workers alert, motivated, able to work and learn, depending on the available resources and personal characteristics. However, when that pressure becomes excessive or otherwise unmanageable it leads to stress. Stress can damage employees' health and the business performance.

Employees are less likely to experience work-related stress when:

- demands and pressure of work are matched to their knowledge and abilities;

- control can be exercised over their work and the way they do it;
- support is received from supervisors and colleagues;
- participation in decisions that concern their jobs is provided (*WHO; adopted from professor Jean- Pierre Brun, University of Laval, Canada*).

Paulik (2009) understands occupational stress as “*substantial, relatively independent part of overall life balancing*”, which follows the total working conditions and their corresponding relationships.

Generally, it can be characterised as “*demands following from working activities and interactions of person with work environment conditions*”. Given the diversity of working activities, variety of the demands is large.

Schematically, workload could be differing to:

- general demands and conditions of working activity;
- the demands on worker’s current behaviour and experience in specific situations;
- the demands on dispositions of workers.

1.2 Symptoms of occupational stress

The experience of stress can alter the way a person feels, thinks and behaves. Symptoms include:

At the organisational level:

- absenteeism, high staff turnover, poor time-keeping, disciplinary problems, harassment, reduced productivity, accidents, errors, and increased costs from compensation or health care.

At the individual level:

- *emotional reactions* (irritability, anxiety, sleep problems, depression, hypochondria, alienation, burnout, family relationship problems);
- *cognitive reactions* (difficulty in concentrating, remembering, learning new things, making decisions),
- *behavioural reactions* (abuse of drugs, alcohol and tobacco, destructive behaviour),
- *physiological reactions* (back problems, weakened immunity, peptic ulcers, heart problems, and hypertension).

Harassment (also known as **bullying, mobbing or psychological violence**) refers to repeated, unreasonable behaviour directed towards an employee (or group employees), aimed at victimising, humiliating, undermining or threatening the harassed person. A person's dignity, professional capability, private life, physical features, race, gender or sexual orientation can be subjects of harassment. It is a significant problem in the European workplace, with considerable costs for both workers and organisations.

Surveys show that 5% of workers in Europe reported being subject of bullying (in 2005). As many 10-17% of workers reported this problem in some European countries.

1.2.1 Occupational stress by gender, age, sector and occupation

The achieved data carried out from 1995- 2005 show little differences between men's and women's work-related stress, and in stress indicators. However, the latest survey in 2005 did show that stress is a little more prevalent among men - 23% compared to women - 20% (*OSHA, 2009*).

Regarding to age, the highest stress levels are observed among middle-aged workers, and the lowest among older and younger worker. It is true that workers from the 25-29 age groups most often report physical violence and harassment and the youngest group (24-years-old or less) reported unwanted sexual attention. The overall fatigue indicator has dropped in all age categories (*OSHA, 2009*).

In 2005, stress was most common in the education and health sectors, in agriculture, hunting, forestry and fishing (28, 5%). The largest group of employees who suffered from anxiety at work were those employed in education and health, public administration and defence, agriculture, hunting forestry and fishing (*OSHA, 2009*).

If well-being score is taken into account, the scores for self-employed workers are lower than for employed workers: 41% of those who are self-employed consider that work has an adverse impact on their health and 25% suffer from stress while doing their jobs. The figures for specific well-being indices, such as irritability, overall fatigue, sleeping problems and anxiety were also worse for the self-employed (*OSHA, 2009*).

Work-related stress is still an elusive concept to many, although the topic is covered in hundreds of papers published every year.

Recent research in the domain of occupational health psychology shows that many stressful experiences are linked to being offended for instance or ridiculed. Conversely, being appreciated is one of the most important factors that increase motivation and satisfaction as well as health and well-being. It is a one of the most fundamental human needs.

1.3 Legislative regulations of occupational stress in the Czech Republic

The legislative regulations about professional psychic overload have started by the Standard Methodology in 1990 such as recommended instructions for the assessment of neuro-psychic overload. It has been developed through Legislative Decrees to the present form (the last amendment was made in 2013).

1.3.1 Government Regulation no. 361/ 2007 about requirements of Public Health Protection at Work

The most important law for a public health practise in the Czech Republic, where there professional occupational stress is also mentioned, is the *Government Regulation no. 361/2007 (the newest version of original version of the Government Regulation was amended in September 2013)* about requirements of public health protection at work.

Paragraph no. 31 of this regulation describes *basic terms about professional psychic overload*, where:

1. Work with professional psychic overload means permanent work that is:

- *connected with monotony;*
- *enforcing pace of work;*
- *performed only at night;*
- *performed in three-shift operation or in continuous work pace.*

2. Work connected with monotony is characterised as:

Work with repetition of the same movement or task actions with limited interference of employee to their processing.

Monotony is divided into two groups:

- *activities with repetition of the same manual movement actions or,*
- *activities with lower number of task actions and lower differencing of these actions.*

3. Enforcing pace of work means work where employees' can't choose the working pace by themselves; they are subordinate to the rhythm of a machine mechanism, or they are subordinate to some actions or rhythm of another employee.

Paragraph no. 32 describes the health risk assessment of this risk factor, where we evaluate:

- *source*
- *other circumstances and influences, which give rise.*

1.3.2 Ministry of Health Decree no. 432/2003 about work categorization

This regulation is tightly connected with the previous Government Regulation no. 9/2013. According to the newest Amendment to Ministry of Health no. 107/2013 for this decree, some changes have been made in the category of occupations that are connected with professional occupational stress.

Thus, works with professional occupational stress belong to the second or third category of work by the following rules:

To *the second category*, we include work where we classify:

- *permanent work performed with forced pace associated with monotony; or in three-shift operation or in continuous work pace*

To *the third category*, we include work where we classify:

- *permanent work with presence or combination of three of more factors, such as forced pace of work, monotony, three- shift operation or in continuous work pace, with social interaction, time pressure and of health threatening of yours or others'.*

Although, phenomena such as *mobbing, bullying or other undesirable behaviour* applied to employee are not subject of categorization, they may be an indicator of professional occupational stress also. In many individuals, these types of influences can cause serious health problems. These aspects must be taken into account, not in a context of categorization but in the context of options contributing to a healthy working environment.

That is why employees are often trained, given additional support, relaxing or other professional assistance in the different ways and methods to prevent stress.

1.3.3 Methods for the evaluation of occupational stress

The present hygienic regulations provide a general framework for the evaluation of professional occupational stress.

We have certain types of assessment available, and there are:

- *questionnaires;*
- *biochemical methods;*
- *psychological testing - influencing of CNS by professional workload;*
- *psychophysiological testing - measure of physiological responses (blood pressure, heart rate).*

Because of their wider use, the first two methods will be described in detail.

Questionnaires

The application of questionnaires offers a possibility of evaluating factors of professional psychic load that include monotony, time pressure or requirements in social interactions.

Their advantages in the fields of study embrace a rapid insight into the problem, the possibility to examine large cohort of person and subsequent statistical evaluation. Many authors, who have successfully used questionnaires in the work concerning hygiene, declare a close relationship between objective and subjective indices of professional overload. But some professionals such as medical doctors, engineers or some non-psychological workers do not accept this type of questionnaire evaluation because of low validity value. For almost 20 years, the questionnaire battery has been used in our public health conditions. The Meister Questionnaire is one of the legislative tools for the evaluation of this risk factor. The exact wording and description of this questionnaire is available in the section “*Methodology and Appendix*”.

Nevertheless, there are two big disadvantages:

- *no unification of methodological procedure and*
- *no saved data from particular counties because of comparing from last years.* (Židková, 2002).

Biochemical methods

Cortisol has a broad range of action and is often characterized as a “*stress hormone*”. Cortisol concentrations follow a strong daily pattern, where they are high upon awakening, reach maximum concentration approximately half an hour later and slowly decrease throughout the rest of day (Adam, 2001). Lifestyle choices and daily stressors affect this natural diurnal cycle, and it has an impact on many physiological systems.

In general, cortisol maintains:

- *blood glucose levels;*
- *CNS function;*
- *cardiovascular function during fasting and increases blood glucose during stress at the expense of muscle protein;*
- *protection of the body against the self-injurious effects of unbridled inflammatory and immune response;*
- *energy to cope with stress by inhibiting reproductive function*
- *several other effects on bone, skin, connective tissue, the GI tract and developing foetus (independent of its stress related functions).*

Transport and Metabolism

Cortisol is transported in blood predominantly bound to **corticosteroid-binding globulin (CBG or also called “transcortin”)**, which binds about 90%, and albumin, which binds from 5% to 7% of the circulating hormone. The liver is the predominant site of steroid inactivation. The circulating half-life of this hormone is about 70 minutes. Cortisol is reversibly inactivated by conversion to **cortisone**. The enzyme 11 β hydroxysteroid dehydrogenase type 2 catalyses this action (11 β -HSD2). The inactivation of cortisol by 11 β -HSD2 is reversible in that another enzyme **11 β -HSD 1**, converts cortisone back to cortisol.

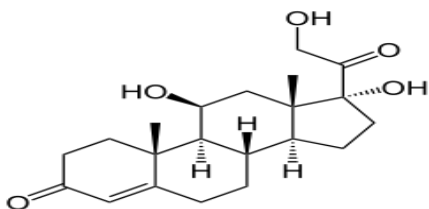


Figure 1 The chemical structure of cortisol (Adapted from Portefield SP, White BA: endocrine Physiology, 3rd ed. Philadelphia, Mosby, 2007)

Psychological Actions

Psychiatric disturbances are associated with either excessive or deficient levels of corticosteroids. They can initially produce a feeling of well-being, but continued excessive exposure eventually leads to emotional lability and depression. People who are deficient in corticosteroids tend to be depressed, apathetic and irritable (*Koeppen & Stanton, 2010*).

1.4 Psychological theories about work - related stress

Moreover, whenever the word stress was mentioned or attempts made to define it, a robust debate followed (*Cooper et al, 2001; Dewe, 2001*). Early definition of stress defined it in terms of stimulus, response, or the interaction between the two. Without any doubt, these definitions have provided much needed information and a considerable body of knowledge now exists as to the nature and characteristics of these different components and their interaction (*Dewe et al, 2010*).

There are, of course, numerous definitions of stress, just as well as there are numerous theories of stress. A fine line exists between the theory and definitions. In this part, we list the most common used models of stress.

A: Lazarus and the Transactional Model of Stress

The transactional model from 1982 defines stress as arising from the appraisal that particular environmental demands are about to tax individual resources, thus threatening, well-being. This definition of stress encompasses a number of themes that capture the transactional nature of stress and those processes that best express the nature of that transaction. These themes involve the following:

- stress is a product of the transaction between an individual and the environment;
- the authority and power of the transaction lies in the process of appraisal that binds the person and the environment and it is this “relational meaning” that this person constructs from the transaction and that lies at the heart of the stress process (*Lazarus, 2001*);
- it is the appraisal process that offers a causal pathway bridge to those discrete emotions that best express the nature of the stress experience (*Lazarus, 2001; Lazarus & Cohen-Charash, 2001*)

B: Person- Environment Fit

Another theoretical model that has been in existence for a considerable amount of time, and which, largely, has underpinned other approaches to stress and well-being is the Person - Environment Fit (P-E fit) perspective. In summary, the basic notion underlying this theory is that there needs to be a match between what people want and what they receive, as well as a match between their abilities (knowledge, skills) and the demands placed upon them. Lack of match creates strain and reduces their sense of psychosocial well-being. However, demands - ability and needs - supply match are considerably more relevant to people when stimuli are important to them (*Edwards, 2000*).

Concept of this model has received widespread recognition in the occupational health and well-being references and numerous investigations have been designed (either explicitly or implicitly) around this concept. There is no doubt that this model occupies an important position in conceptualizations of both work stress (strain) and work-related well-being, and that theory has several practical applications. This model has generated critical lessons for organizations in relation to stress management interventions and occupational health and well-being promotions (*Dewe et al, 2012*).

C: Conservation of Resources Theory

Another, very popular theoretical model of stress process is that developed by Steven Hobfoll from 1989, known as the Conservation of resources (COR) theory.

This perspective bears marked similarity with the P-E fit model, specifically in that both approaches examine the interactions of a person and the environment and the degree of correspondence between demands in the environment and the individual's resources to deal with those demands. One key difference is that the P-E fit model focuses predominantly on people's perception of fitness, whereas COR theory incorporates more objective indicators of actual fitness (*Hobfoll, 2001*). In a work context, for example, having autonomy in one's job, the amount (and type) of feedback received on one's job performance, and the level of rewards obtained for successful job performance, are all illustrations of environmental resources (*Hakanen, Perhoniemi, & Topinnen- Tanner, 2008*). Social support from work colleagues and organizational support for individuals (accommodating their needs) also represent major environmental resources, which can reduce stress and burnout (*Hallbesleben, 2006*), as well as enhancing positive well-being (*Luczynska & Cieslak, 2005*).

D: The Job Demands- Control- Support Model of Work Design

A somewhat different, but nonetheless complementary approach to those outlined above, is a theory of work design proposed initially by Karasek from 1979 and later expanded by Karasek and Theorell from 1990.

He proposed that, although excessive job demands or pressures (both physical and psychosocial) can have on stress levels (especially psychological strain), by themselves, these demands are not the most important contributors to strain experiences. Rather, the amount of strain people experience in their work will be determined by whether or not they have any control over the demands they have to deal with (*Dewe et al, 2012*).

Several issues remained unresolved with respect of this model. One is whether the effects of demands and control are additive or multiplicative (that is, there is an interactive effect between them). A second issue, which has not been fully resolved, is whether objective control or subjective control is the critical factor in determining stress reaction. This model has some empirical support in several studies demonstrating influence of discretion or control on the relationship between job demands and psychological strain (*Beehr et al, 2001*). Nevertheless, there has been controversy about whether the approach is universally applicable. For instance, a very recent study (*Panatik et al, 2011*) did not obtain moderator effects for perceived job control in a sample of Malaysian technical workers, but rather found that feelings of self- efficacy functioned as a moderator of demands- strain relations. It's possible that the Western emphasis on personal control (at work and in other aspects of life) does not generalize to non- Western cultures, which may value more group- oriented mechanisms.

Nevertheless, the theory has numerous practical applications, in that it suggests procedures for enhancing well- being at work and reducing the impact of stressors. Finally, it is linked with other theoretical accounts of the work stress process, such as the Effort- Reward Imbalance Model (*Siegrist, 2009*).

1.5 Teachers Stress- definitions, sources, coping of stress and limitation of research

Research on teacher stress has become a major area of international research interest. During the 1980s, the number of studies reporting on teachers stress grew rapidly. Teaching in schools is now widely recognised as being one of the “high- stress” occupations.

Worldwide surveys reveal widespread concern about the effects of stress on teachers' sense of well-being and their willingness to stay in the profession. Elementary schools are according results of studies one of the most vulnerable groups (Žídková & Martínková, 2003). Compared to the general population, teachers are at risk for higher level of psychosocial distress and lower levels of job satisfaction (Schonfield, 1990). This group of teachers are exposed to time pressure and big responsibility to a high degree of neurotic complaints including decreasing of work performance (Paulík, 1998).

1.5.1 Definitions of Teacher Stress

Teacher stress can be defined as *“the experience of a teacher of unpleasant, negative emotions, such as anger, anxiety, tension, frustration or depression, resulting from some aspects of their work as a teacher”* (Kyriacou, 2001).

Number of researchers has focused on the notion of teacher burnout, which is regarded as *“a state of emotional, physical and attitudinal exhaustion which may develop in teachers who have been unsuccessful in coping effectively with stress over a long period”* (Vandenberghe & Huberman, 1999).

1.5.2 The main sources of Teacher Stress

Teacher stress can be caused by a variety of situations. Stress often comes about when teachers have difficulty negotiating various aspects of interactions with students (Hepburn and Brown, 2001) or from any circumstances, that are considered too demanding, depriving of time, and interfering with instruction. Recent studies reporting of teachers stress (Pithers & Soden, 1998) indicate the main sources of stress that teachers face:

- *teaching pupils who lack motivation;*
- *maintaining discipline;*
- *time pressure and workload;*
- *coping with changes;*
- *dealing with colleagues;*
- *being evaluated by others;*
- *self-esteem and status;*
- *administration and management;*
- *role conflicts and ambiguity;*
- *poor working conditions.*

However, teacher stress can be explained best by categorizing factors into “*first and second order stressors*”.

First order stressors directly interfere with teacher’s effort and can include:

- *student apathy, student disruption or discipline, poor student attendance, high student to teacher ratios (large classes),*
- *paperwork, irresponsible colleagues, obtrusive supervisors,*
- *lack of effective leadership such as assistant principals or principals,*
- *seemingly non-supportive parents.*

These mentioned stressors that occur most frequently tend to be organizational issues dealing with students, administration, other teachers, and other work relationships (*Blasé, 1986*).

Second order stressors do not interfere directly with teacher effort and can include issues:

- *low salary, emotional fatigue, frustration, helplessness;*
- *stagnation, boredom, loss of motivation or enthusiasm.*

A major source of teacher stress can be directly attributed to the students. Through survey and interview responses, teachers most commonly refer to students as being responsible for most of their stress. Most teachers view disrespectful behaviour, student attentiveness, and sociability as the most stressful student misbehaviours (*Hastings & Bham, 2003*).

Primary school teachers are responsible for one class throughout the entire school year which makes teachers not only responsible for educational activities, but for moral and social development as well. More responsibility, along with work pressure and student misbehaviour, causes the primary school teachers to have the highest level of stress (*Blasé, 1986*).

Stress among teachers can also be grouped into three categories:

- *role demands-* ambiguity, overload, conflict preparedness, and non-participation;
- *instructional problems-* problems associated with a variety of specific tasks that teachers must perform in their teaching role (difficulties with student discipline, competence, inappropriate procedures for student placement, instruction, inadequate standardized tests, marking systems);
- *interpersonal relationships* - conflict with other staff members, and a lack of social support from supervisors and co-workers.

Causes of teacher stress can also be broken down into *environmental and individual stressors*.

Most stressors can be found in the work environment and include:

- unfavourable working conditions;
- heavy workloads, organizational problems;
- paucity of resources, lack of support or autonomy and decision-making;
- physical stressors such as task-related noise, school, safety or youth violence (*Hastings & Bham, 2003*).

1.5.3 Coping with Teacher Stress

Although each teacher has a unique personality and therefore will find some idiosyncratic coping methods for negotiating stress, two stress reduction strategies are recommend:

- *social support as an effective means of stress reduction - having close, trusting relationships with colleagues boosts teachers ability to alleviate negative emotions and reduce stress responses;*
- *reduction of emotional rumination;*
- *use of relaxation techniques.*

However, studies recommending these techniques tend to have methodological limitations, thus the evidence for their usefulness is weak (*Kyriacou, 2001*).

1.5.4 Limitations of Teacher Stress Research

Many teacher stress studies, especially those deriving their findings from one- time, self-report questionnaires, are strongly criticized for three important reasons:

- the use of one shot questionnaires presumes that stress is a relatively stable or fixed state as opposed to a more fluid process;
- these one-time surveys often are administrated retrospectively without considering the time lapse between stressful event and survey responses;
- the questionnaire approach often gathers isolated facts about stress with little guidance from relevant theories (*Jarvis, 2002*).

1.6 Characteristic of firefighters' profession

Emergency workers, where firefighters' profession is included, have (in terms of mental and physical demands) also its specific features that determine this profession as an activity highly demanding in both aspects. We may include above all a high level of physical activity, an intense stress during rescue operations, working night shifts, exposure to noise, high temperature, toxic substances etc. (*Šváb, 2006*).

From the foregoing points, it is clear that both teaching and firefighter profession belong to occupations with high exposure to professional occupational stress. From the view of stress response, it is different. In the case of teachers, it is going about chronic persistent mental workload enhanced by the perception of low social prestige of this profession (*Paulík, 1998*). In the case of firefighters, we can talk about acute stress response- short attacks of extreme stress during the intervention, often followed by the release and satisfaction of the job well done. The range of emergency tasks covered by firefighters obviously includes preventing and combating fire, assisting in major transport accidents (car crashes involving trapped people, aviation), industrial accidents, natural disasters, terrorist attacks or civil riots or when special help is needed (*OSHA, 2011*). They have greater choice in decision-making, work brings them satisfaction, and they find their job interesting and variable. This partially eliminates the adverse effects of other factors, such as work under time pressure or high responsibility. Dangerous of mental overload in this profession is not just often, but very various. It depends on "*kind and length of intervention*".

A: Short-term, temporary reactions and states:

- *feeling of discomfort - noise, tight uniform etc.;*
- *fatigue or temporary decrease of mental performance;*
- *emotional moody states - somatic or behavioural.*

B: Long-term, permanent reactions and states:

- *job dissatisfaction or burnout;*
- *more serious behavioural changes - psychosis, posttraumatic stress reaction, problems with adaptation;*
- *more serious somatic diseases - cardiovascular, gastrointestinal problems, chronic fatigue, sleeping disorders etc.*

2 SALIVARY BIOMARKERS AND THEIR USING IN EPIDEMIOLOGICAL RESEARCH

The addition of biological measures (“biomarkers”) to large-scale social science and epidemiological studies has recently been advocated by a number of funding bodies (*Finch et al, 2001*). In this interdisciplinary approach, extensive information and behavioural processes, health behaviours and self-reported health in existing large-scale, representative samples, is complemented by the addition of objective biological markers of physiological processes and pre-disease.

Measures of the hypothalamic pituitary adrenal axis (HPA) and in particular levels of salivary cortisol are obvious candidates for inclusion in these studies, given the important role that the HPA axis plays in “transducing” subjective social- environmental experience into physiological changes relevant to health.

2.1 Saliva as a new potential biological fluid

In humans, oral fluid originates mainly from three pairs of major salivary glands (parotid, sublingual and submandibular) and from large number of minor salivary glands. Parotid glands are entirely serous glands since their secretion lacks mucin, whereas submandibular and sublingual glands are mixed sero-mucous. Minor salivary glands are mainly Von Ebner glands - entirely serous organs situated in the connective tissue below the circumvallate papillae and Blandin- Nühm mucous glands (*Carranza et al, 2005*).

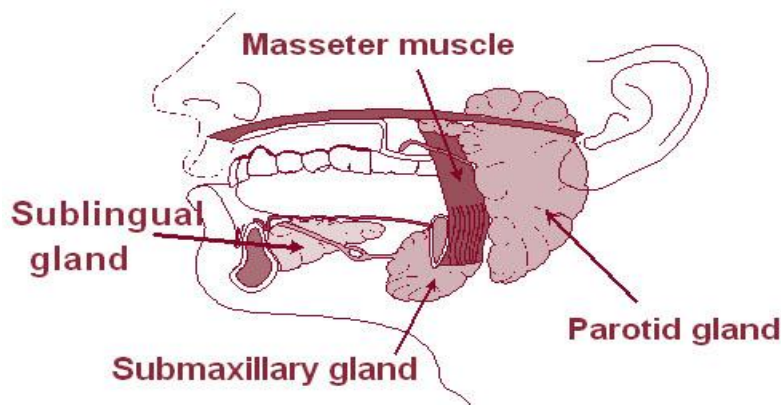


Figure 3 Salivary glands (adapted from National Cancer Institute- SEER Training Modules)

2.1.1 Salivary production and composition

A compositional analysis of oral fluid may be important for its implications in physiology, pathology and in diagnosis of oral and systematic diseases.

Saliva has various compounds and these are (*Actis et al, 2005; Larsson et al, 1996*):

- *inorganic;*
- *organic non protein;*
- *protein/polypeptide;*
- *hormones and lipid molecules.*

A: Inorganic compounds

Whole saliva contains mainly water, strong and weak ions (Na^+ , K^+ , Ca^{2+} , Cl^- , HCO_3^- and $[\text{HPO}_3]^{2-}$) which can generate buffer capacity. The primary secretion from salivary glands is plasma ultrafiltrate (isotonic compared to plasma) but in salivary ducts is energy-dependent reabsorption of Na^+ and Cl^- resulting in a hypotonic fluid secretion, with lower ion concentration compared to plasma (*Booth et al, 2002*).

Several factors may modify the salivary ionic concentration; furthermore, the composition of unstimulated saliva is different from stimulated saliva (which is more similar in composition to plasma). For example, an increase in the salivary flow rate, obtained by stimulation with acidic food, increases the concentrations of salivary potassium and phosphate, compared with unstimulated saliva (*Jensdottir et al, 2005*).

B: Organic compounds (non- protein and lipids)

Small amounts of organic non-protein compounds can be detected in saliva. Uric acid is one of the most important antioxidant compounds in saliva (*Guan et al, 2003; Diab-Ladki, 2003*). Saliva moreover contains glucose, amino acids, lipids (cholesterol and mono/di glycerides of fatty acids (*Marini et al, 2002; Actis et al, 2005*).

In saliva also measurable:

- *amines such putrescine, cadaverine and indole (Cooke et al, 2003);*
- *α -linoleic acid and arachidonic acid (Actis et al, 2005);*
- *lactate (Chicharro et al, 1998).*

C: protein/Polypeptide compounds

The salivary levels of total protein increase also through β - sympathetic activity in the salivary glands, since saliva secretion is mainly evoked by the action of adrenergic mediators (*Chicharro et al, 1998*). Saliva contains a large number of protein compounds of which the structure and function have been studied with traditional biochemical techniques, including liquid chromatography, gel electrophoresis, capillary electrophoresis (CE), nuclear magnetic resonance, mass spectrometry, immunoassays (RIA, IRMA, EIA ELISA) and lectin probe analysis (*Hu et al, 2005; Huang et al, 2004*).

Among the salivary proteins obtained by classical protein analysis methods, those deriving from salivary gland productions can be recognised. The most abundant are amylase, PRPs secretory IgA and carbonic anhydrase (*Sönmezoglu et al, 2005*).

Human saliva proteins can have a wide range of functional properties. They can be related to the immune system and oral defence like lysozyme, lactoferrin, lactoperoxidase, immunoglobulins, agglutinins, chitinases and mucins, which in saliva participate in the protection of the oral tissues; other proteins have bacteria-killing properties, like histatins and defensins. The salivary immunoglobulins are mainly s-IgA (> 85%), are produced directly by the B lymphocytes present near the salivary glands. The remaining 5-15% of salivary immunoglobulins are mainly IgG and IgM, derived from crevicular fluid or from plasma leakage (*Van Nieuw Amerongen et al, 2004*).

D: Hormones

Some hormones commonly measured in plasma, such as steroids, non-steroids, peptide and protein hormones, can be detected in the oral fluid. It may derive also from the circulation by passive diffusion or active transport or originate partly from both sources (*Kennedy et al, 2001*). Steroids detection is perhaps the most interesting application in salivary hormonal studies. Steroids have often been studied because salivary- free steroids hormones can give good information on serum- free levels (*Kumar et al, 2005*).

The most commonly assayed biomarkers in saliva are:

- *cortisol, testosterone, dehydroxyepiandrosterone (DHEA),*
- *17- hydroxyprogesterone, progesterone and aldosterone (Patel et al, 2004; Hansen et al, 2003; Whembolua et al, 2006; Lu et al, 1999, Chatteron et al, 2005 & Contreas et al, 2004).*

Salivary cortisol measurement is today a widely accepted alternative to the determination in plasma or serum: since the adrenal cortex is responsive to stress, venepuncture for blood collection can lead to an iatrogenic increase of plasma glucocorticoid levels.

From this perspective, the stress-free salivary collection for cortisol measurements has an advantage compared to plasma, especially when cortisol measurement has to be carried out in children (Gröschl *et al*, 2001).

In saliva, cortisol appears mainly in free form. Its concentration is approximately two thirds of unbound cortisol in serum and correlates well with this serum fraction. About 15% of salivary cortisol is bound to transcortin, a normal component of uncontaminated parotid saliva. The transfer from serum to saliva is performed by free diffusion of unbound cortisol through the acinar cells of the salivary glands and the equilibrium between serum and saliva is reached in less than 5 minutes. The salivary cortisol concentration is independent of saliva flow rate and of the serous and mucous content (Aardal & Holm, 1995).

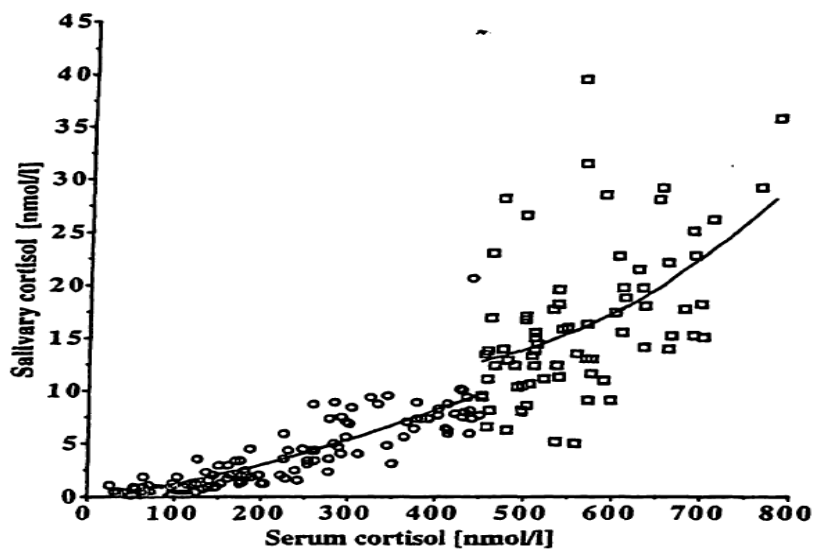


Figure 4 Correlation between the concentration of cortisol in saliva and serum (Adapted from the study of Aardal and Holm: Cortisol in saliva – References Ranges and Relations to Cortisol in Serum, 1995).

2.2 Methodological aspects of salivary biomarkers using

Nowadays, the saliva research field is rapidly advancing due to the use of novel approaches that include metabolomics, genomics, proteomics and bioinformatics. The usefulness of saliva as a research material depends on the application of pre-analytical procedures for the assay in saliva. The relatively easy non-invasive nature of collection and the relationship of saliva with plasma levels make saliva an attractive diagnostic tool (*Schipper et al, 2007*). Especially hormone analysis is a proven alternative to plasma. In addition, the effect of pre-treatment and storage conditions on the different salivary parameters is important to be taken into account.

2.2.1 Saliva collection

Saliva can be easily collected from humans. Patients are able to collect saliva at home under stress-free conditions. The standardization of salivary collection has a great importance in saliva analysis because several factors may affect salivary flux and composition.

Patients are required to receive detailed information about the collection protocol (*Jacobs et al, 2005; Kudielka et al, 2003*):

- *the importance of the exact timing of the samples;*
- *to exclude brushing teeth before the collection;*
- *avoid food and fluid (apart from water) ingestion or chewing gum for at the least 30 minutes before collection;*
- *rinsing the mouth with water (preferably distilled).*

Unstimulated whole saliva can be collected with several oral fluid collector devices and commercial devices are available:

- *passive drooling* (no oral movements): allowing saliva to drain off the lower lip into a plastic vial;
- *spitting directly into a collector vial*: specimens collected by spitting contain up to 14 times more bacteria than those collected by drooling and this can affect storage and further analysis of several components (*Nurkka et al, 2003*).

Stimulated whole saliva can be obtained with oral movements such as gentle mastication or with the use of citric acid.

Citric acid has the potential to stimulate salivary secretion and it lowers the sample pH (<3.0), but it may also affect analysis results in hormonal immunoassay by interfering with antibody binding (*Schwartz et al, 1998*).

To avoid analyse interference, non-cotton based sampling are available:

- *polystyrene foam swabs* (*Hodinka et al, 1998*);
- *rayon balls*, such as Orapette- Trinity Biotech Dublin/ Ireland (*Mylonas et al, 2006*);
- *polyester Salivette- Sarsted*, Newton, NC (*Shirtcliff et al, 2001*).

Saliva sampling, being a new way of measuring biomarkers, also has to avoid the contamination of saliva by blood. Considering that the concentration of salivary biomarkers can be 10-100fold higher in blood than in saliva, blood contamination (by periodontal disease, dental carries, injury or vigorous teeth brushing) can significantly affect the quantitative estimate of their salivary concentrations. A possible solution to minimise contaminated samples could be check for blood contamination using occult blood testing techniques during collection (*Granger, 2000*).

Contamination of samples from environmental sources of the biomarker during collection may also occur, and this may lead to measurement errors. This can be minimised by collecting the samples away from the worksite and ensuring that the subjects rinse their mouths thoroughly before collection.

Finally yet importantly, personal habits such as chewing betel nut may give rise to contamination of saliva by other extraneous substances and hence should be excluded before sampling (*Koh et al, 2011*).

2.2.2 Saliva storage

Saliva specimen, after collection, should preferably be kept on ice, aliquoted and frozen as soon as possible to maintain the sample integrity. The refrigeration prevents the degradation of some molecules in saliva and, when necessary, bacterial growth must be prevented.

With regard to saliva storage and cortisol, this hormone seems to decrease its concentration by 9.2% /month at room temperature, but at 5°C, no effect on salivary cortisol concentration for up to 3 months was demonstrated.

Furthermore, *Garde and Hansen (2005)* demonstrated that repeated cycles of freezing and thawing did not affect the concentration of salivary cortisol.

There are some general approaches to avoid degradation of salivary compounds that the specimen should be stored taking into account:

- *store saliva aliquots immediately without any processing*; specimen can often be stored at room temperature (when analysis is carried out immediately or in 30-90 minutes from collection), at + 4°C (when analysis is carried out in 3-6 h from collection), at -20 °C and better at -80 °C (when analysis is carried out days to months after collection);
- *snap-freezing* of saliva in liquid nitrogen;
- *inhibition of the enzyme activity* present in saliva (*Nurkka et al, 2003*);
- *addition of sodium azide* to saliva specimens in attempt to retard bacterial growth. The use of sodium azide does not influence the measurement of salivary markers when serum based immunoradioassays are modified for saliva, not even if these methods involve separation or extraction steps (*Whembolua et al, 2006*);
- *addition of trifluor acetate to 10% water solution*, to denature salivary enzymes that could degrade several salivary compounds, such as proteins and steroid hormones (*Gröschl et al, 2001*).

2.2.3 Analytical methods for the measurements of hormones in saliva

In practice, two basic methods are used for the measurements in saliva and these are:

- *immunological methods*
- *chromatographic methods*

A: Immunological methods

Immunoassays have been widely used for analysing salivary hormones because they are relatively simple to use, require small sample volumes (< 100 µl) and are analytically sensitive. However, immunoassays do not always have the analytical specificity required for distinguishing the desired hormones in the presence of cross-reactants commonly seen in neonates, pregnant women and patients with certain diseases.

In most cases, commercial RIA adaptation included an adjustment of the protein content of the standard buffer and the dilution of the samples, leading to better precision and accuracy of salivary hormone measurements. These adjusted RIA methods, however, were applied only for steroids but not for peptide analysis (*Gröschl, 2008*).

B: Chromatographic methods

Modern liquid chromatography, coupled with mass spectrometry (MS) detection, provided vast improvements in analytical specificity and sensitivity. These methods, based on the generation of gaseous ions of the molecule or specific fragments, characterized and quantified by the specific mass-charge (m/z) ratio, were used for two different applications. One application used in saliva samples was the detection of new peptides or proteins that can be identified by either MALDI- TOF (*Vitorino et al, 2004*) or SELDI TOF MS (*Schipper et al, 2007*).

The second application was liquid chromatography-tandem MS for quantification of salivary steroids (*Rauh et al, 2006; Jónsson et al, 2003*). We may consider that many problems, described for immunoassay, can be prevented with this very specific and sensitive method, which enables screening of a complete profile of steroids in one sample.

2.3 Salivary cortisol in epidemiological research

As a result, epidemiological studies incorporating HPA axis measures have the potential to offer assessment of typical HPA in healthy population. Norms regarding the functioning of the HPA axis are differed by racial/ethnic groups, age, and gender. Also, information on HPA- axis functioning is in relation to the full range of pre-disease and disease states present in the general population (*Adam et al, 2009*).

Increasingly, researchers are focusing on the marked diurnal rhythm in the release of cortisol with various elements of this rhythm viewed as essential indicators of HPA axis functioning. Healthy HPA axis function is thought to require the presence of strong diurnal patterning and deviations from the typical diurnal cycle of cortisol provide valuable information regarding environmental influences on the HPA axis and the role of the HPA axis in disease process (*Stone et al, 2001*).

The major elements of the diurnal cortisol rhythm that are typically assessed:

- *the size of the CAR (cortisol awakening response)* - it has been correlated with variety of psychosocial processes and health outcomes (*Clow et al, 2004; Adam et al, 2006, Nater et al, 2007*). Either absence of a CAR or an atypically larger CAR has been found in past research to associate with negative health outcomes. Most large-scale studies collect samples at awakening, followed by another sample collection between 30-45 minutes later (*Cohen et al, 2006*).
- *diurnal cortisol slope* - best measured as the rate of decline in cortisol levels across the day, typically across the entire span of time from awakening to bedtime.

Flattening of the diurnal slope, indicated by a slower rate of decline in cortisol during the day, has been related to both chronic and acute psychosocial stress (*Adam et al, 2006,*), sub-clinical disease (*Matthews et al, 2006*) and increased mortality from breast cancer (*Sephton et al, 2000*). Steeper decline typically associated with better psychosocial and physical stress.

- *area below the daytime cortisol curve* - an estimate of average cortisol exposure (*Badrick et al, 2007*); it can be calculated using data from all samples collected (including the CAR values) or only from samples collected for assessment of the slope. It measures unique information, however as they reflect the average level of cortisol during the day, which is not particularly strongly associated with awakening to bedtime diurnal slope.

2.3.1 Covariates related to diurnal cortisol secretion

Large-scale epidemiological studies also have sufficient power and degrees of freedom available to employ multiple covariates for confounding influences that may account for or obscure associations between social exposures, HPA axis variables and disease states.

Covariates that have been related to diurnal cortisol secretion can be divided into a few groups and these are:

Typically collected on day of sampling schedule:

- *weekend vs. weekday*
- *time of awakening*

Lifestyle:

- *smoking - number of cigarettes usually smoked;*
- *alcohol use;*
- *caffeine;*
- *exercise/activity level;*
- *perceived stress and negative mood;*
- *recent meal.*

Not specific to day of sampling:

- *gender;*
- *socioeconomic status;*
- *race/ethnicity;*
- *age;*
- *pubertal stage.*

Medical/ health

- *physical health diagnoses;*
- *mental health diagnoses;*
- *body mass index/obesity;*
- *medication use;*
- *menstrual timing.*

Typical exclusion criteria:

- *use of steroid-based medications;*
- *3rd trimester of pregnancy;*
- *illness on days of testing;*
- *presence of endocrine disorder.*

2.3.2 Design and analysis recommendations for salivary cortisol research***A: Study design***

1. Participant selection strategy needs to be made a priori (for example, from a national database or from all schools in a specific area in order to generalize findings);
2. The number of participants included needs to be sufficient to have power to examine the research question at hand.

B: Sample collection

1. Sample collection protocols need to match the complexities of protocols and degree of participant burden to the characteristics of the population under consideration;

2. Thorough and clear instructions to participants are necessary, including detailed descriptions how to collect samples, where to place sampling materials and how to return samples;
3. Data collection kits should be made as user friendly as possible and age appropriate.
4. Saliva collection should be designed at minimum collect information on the CAR and the slope of diurnal decline of cortisol secretion. The minimal protocol currently employed in population-based research involves: one sample collected on awakening, one at the peak of the cortisol awakening response (typically 30 minutes after awakening) and one at bedtime;
5. Employment of saliva collection protocols across 1 day improves the ability of study to draw conclusions regarding the trait better than day-specific state components of diurnal cortisol activity. Concerning the assessment of the CAR and diurnal slope, addition of more days of data with minimal protocol provides more important information than addition of more data points within a single sampling day;
6. All times of collection need to be recorded, with an emphasis placed on accurate reporting of sample times, regardless of whether samples were taken at the requested times.
7. A minimum set of covariates must contain an assessment of waking time on day of collection and information on health-related confounds known relate to cortisol;
8. Use of electronic monitoring devices to measure timing of sample compliance for at least a subsample.

C: Analyses

1. In sufficiently large studies, it is better to model the effects of noncompliance with the timing of sampling protocols rather than removing the data or less compliant participants.
2. Values found outside the three standard deviations above mean level of cortisol should be removed either from analyses or from winsorized to the three standard deviations above the mean level.
3. The CAR, diurnal cortisol slope and area under the curve across the day should each be modelled as separate indicators of diurnal cortisol functioning. Area under the curve measures provides an indication of total cortisol across the day, but current evidence suggests that the diurnal cortisol slope and CAR are more meaningfully related to stress exposure and disease outcome.

4. In rare instances, where many samples per day or multiple days of data are available in large-scale research projects, multilevel modelling techniques should be employed to model individual differences in diurnal cortisol rhythms.

2.3.3 Future directions for epidemiological salivary cortisol research

The addition of salivary cortisol protocols to large-scale studies heralds a new exciting period for HPA axis research that should lead to a better understanding the role of daytime cortisol secretion, its behavioural and biological correlates and how it relates to the development of disease. More research is, however, necessary to quantify the extent of unreliability introduced by minimal protocols and the extent to which that unreliability compromises investigators' abilities to detect effects to interest, despite the additional power provided by large sample sizes. Research that is specifically designed to help to guide difficult protocol choices, such as whether it is better to gather fewer samples over multiple days or more samples over the day, would be helpful.

While evidence indicates that collection of cortisol, data on single days may contribute to lower reliability of cortisol measurements and may bias results towards state rather than trait measures, most of the current large-scale collections are collected in this way. It remains to examine whether and the extent to which this has compromised investigators' ability to observe prospective associations (*Adam et al, 2009*).

3 PREVENTION OF OCCUPATIONAL STRESS; HEALTH-RELATED QUALITY OF LIFE

„Every patient carries her or his own doctor inside”.
(Albert Schweitzer, 1875-1965)

The prevention and management of occupational stress is a great challenge. Although there is often insufficient understanding of the genesis of stress in any given situation, it is frequently possible to apply existing knowledge to control this problem.

3.1 Risk assessment of occupational stress

Managing stress at work requires a systematic approach that includes risk assessment and continuous evaluation. We need to realize that work related stress is preventable and any action to reduce this phenomenon can be very cost-effective. Risk assessment involves the same basic principles and process as for any other workplace hazards. Including workers and their representatives into this process is crucial to its success; they should be asked what causes stress, which groups suffer and what could be done to help them.

Everyone involved in education, including teachers, pupils, parents, administrators and safety and health professionals have a role to play in tackling work-related stress. The European Commission issued the Health and Safety Executive guidance on tackling WRS. Moreover, education was involved as well.

The steps of risk assessment can be summarised as:

- *identify the hazards;*
- *decide who might be harmed and how;*
- *evaluate the risk by identifying what action is already being taken;*
- *deciding whether this is enough; and*
- *if it is not, deciding what more should be done.*
- *recording the findings;*
- *reviewing the assessment at appropriate intervals and checking the impact of measures taken.*

More guidance is given on each of the stages of risk assessment together with suggestions for possible action

1. Finding factors to look out for are:

- *culture or “atmosphere” of the organisation and how it approaches WRS;*
- *demands such as workload and exposure to physical hazards;*
- *control - how much influence workers have in the way they do their work;*
- *relationships - covering issues like bullying and harassment;*
- *change - how organisational change is managed and communicated;*
- *role - whether the workers understand their role in the organisation and that conflicts in their role are avoided;*
- *support from colleagues and managers;*
- *training to give workers the skills to perform their task;*
- *individual factors.*

2. Deciding who might be harmed and how

We are all vulnerable, depending on the pressure we are under at any given time. The factors identified above will help to determine who is at risk. In the case of teachers, this step should cover all workers at educational establishments, including teachers, administrative staff, facility management personnel and maintenance staff, regardless of whether they have long or short-term contracts. It may also include pupils and visitors to the school who are directly or indirectly at risk.

3. Evaluating the risk

For each of the factors in step 1 the following questions should be asked:

- *what action is already being taken;*
- *is it enough;*
- *what more needs to be done.*

Some ideas of what to look out for and what to do:

A: Culture

“Is there good, open communication, support and mutual respect? Are opinions of workers and their representatives valued?”

“If not, communication should be improved, particularly for staffs who work remotely.”

B: Demands

Is staff overloaded or under loaded? Do they have the capabilities and capacities for their tasks? What about the physical (noise, vibration, ventilation, lighting) and psychosocial (violence, bullying etc.) environment?

Sufficient resources should be made available if there are problems, e.g. tasks should be re-prioritised.

Staff training should enable people to carry out their tasks competently.

C: Control

Do individuals have sufficient word in the way their work is carried out?

Staff should have control to plan their own work and make decisions about how their work should be completed and how to solve problems.

A supportive environment is crucial.

Relationships

How are the relationships between colleagues and managers? What about the relationships between managers and senior managers? Is there any evidence of bullying or harassment?

Procedures should be made available, such as disciplinary and grievance procedures to deal with unacceptable behaviour.

A culture where staff trust each other and recognise each other's contributions should be supported.

Change

Are workers anxious about their employment status? Are they confused by workplace changes and by what it means for them and their colleagues?

Giving staff the chance to influence change makes them more involved.

4. Recording the main findings

It is good practise to record the main findings from the assessment, and to share the information with employees and their representatives. This record should help to monitor progress (*OSHA, 2002*).

3.2 Actions to address work-related stress in education

In educational sector, problems should be categorised in terms of risk factors:

- *the job,*
- *external (for example family);*
- *school/pupils/students;*
- *organisational, community and societal.*

This approach highlights the usefulness of a public health strategy for identifying and managing problems in the education sector.

A: Actions to improve the work environment

- *to establish a mentoring or coaching scheme for all current staff;*
- *to establish a mentoring or coaching scheme for new staff, organised by type of work;*
- *to develop an information and awareness-raising programme; for example holding “staff well-being days” or producing newsletters and posters;*
- *to designate a health and safety representative/coordinator knowledgeable about psychosocial issues;*
- *when carrying out risk assessment, set up a steering group;*
- *to reinforce and reward good standards of behaviour;*
- *to encourage collaborative problem-solving and good communication;*
- *to create opportunities for feedback, for example give praise and provide constructive, performance-related feedback;*
- *to build organisation-wide commitment by demonstrating management support, raising awareness and promoting good practice;*
- *to provide access to occupational health support (internal and external);*
- *ensure all staff know about work-related stress and train them to identify the symptoms of stress;*
- *to provide training on stress management for managers and workers;*

- *to develop and encourage employee development and learning to equip staff to improve worker performance;*
- *to provide training for workers, especially for teachers, covering behaviour management and the teaching skills to deal with difficult behaviour;*
- *to reward positive attitudes and promote positive role models (both for workers and pupils/students);*
- *for teaching staff, teach and reinforce respect and good behaviour;*
- *to establish parent-teacher committees and involve them in any change management processes;*
- *to involve staff in the risk assessment process, for example in hazard identification and suggestion of solutions;*
- *to involve workers in management processes changes;*
- *to encourage involvement of and communication with parents and families;*
- *to check and maintain the quality of the work environment and equipment.*

B: Actions to improve work organisation and workload

- *to raise awareness and train managers in the causes and solutions for work-related stress;*
- *to get a commitment at all levels of an organisation to tackle work-related stress;*
- *frequently review workload, demands and overtime;*
- *to examine the work patterns of staff so they get “non- contact” time;*
- *to let workers choose their methods, patterns and pace of work;*
- *if necessary, review and redistribute workloads and deadlines;*
- *to review processes for staff management to ensure that workers are not overloaded, as it may occur when they are given multiple roles (e.g. class teacher and topic coordinator and student teacher).*

C: Actions to put policies and support in place

- *to develop policies to support and reinforce a positive work environment;*
- *to develop and implement a written policy on work-related stress for staff;*
- *to develop procedures and strategies for stress prevention and assess policies regularly;*
- *to develop actions with students and parents to improve behaviour, for example putting in place regular breaks and reward programmes;*

- *to perform annual assessments of work-related stress and its impact;*
- *to evaluate in the long-term process the risk management programmes;*
- *to focus on the long-term process of organisational learning as well as the short-term benefits of high visibility events and training;*
- *to use facts and figures to monitor and evaluate any change programmes;*
- *to perform regularly stress audits on organisational symptoms - for example high absenteeism, high turnover or poor industrial relations-;*
- *to carry out audits on violence and bullying;*
- *to provide childcare facilities and flexible work practises such as job sharing;*
- *to assess formal and informal communication and reporting lines;*
- *to establish a system of open consultation prior to making major changes;*
- *to make stress management part of normal management practice;*
- *to work with local community and the media to promote awareness of the impact of stress on teaching quality and the health of workers and encourage positive, supportive behaviour (OSHA, 2008).*

3.3 Quality of Life – definitions, instruments for measurement

Life expectancy and causes of death have traditionally been used as key indicators of population health. While these indicators provide critical information about health status of populations, they do not offer any information about the quality of the physical, mental and social domains of life. Increasing life expectancy has also highlighted the need for other measures of health; especially those that capture the quality of life of the years lived (WHO, 2005).

The constitution of the World Health Organisation (WHO) defines health as “*a state of complete physical, mental and social well-being not merely the absence of disease*”. It follows that the measurement of health and the effects of health care must include not only an indication of changes in the frequency and severity of diseases but also an estimation of well-being and this can be assessed by measuring the improvement of the quality of life related to health care.

WHO defines quality of life as “*individuals’ perception of their position in life in the context of the culture and value system in which they live and in relation to their goals, expectations, standards and concerns*”.

It is a broad ranging concept affected in a complex way by the person's physical health, psychological state, level of independence, social relationships, personal beliefs and their relationship to salient features of their environment.

Conceptually, quality of life can be divided into:

- **health-related QoL**- physical, psychological, social and spiritual subdomains;
- **non-health related QoL**- personal, social interaction, societal, and environmental subdomains.

When quality of life is being considered within the context of health and disease, it is commonly referred to as *health-related quality of life (HROQoL)* to differentiate it from other aspects of quality of life. Health-related quality of life is increasingly utilized for measurement of treatment to measure the burden/impact of diseases in individuals and groups, and for the use by individual patients, investigators, clinicians and policy makers to assist in decision making.

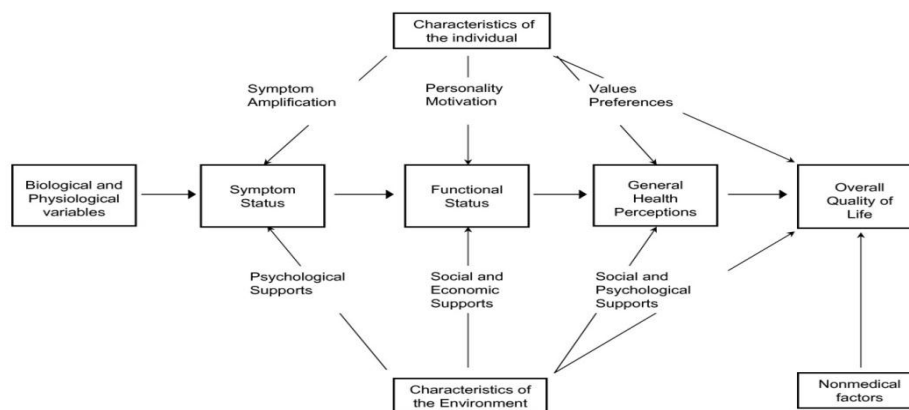


Figure 7 A causal pathway model of health-related quality of life (Adapted from Mathisen et al. Health and Quality of Life Outcomes 2007 5:27)

Since health is a multidimensional concept, HRQoL is also multidimensional and incorporates domains related to physical, mental and social functioning (Ferrans, 2005). HRQoL goes beyond the direct measures of health and focuses on the quality of life consequences of health status. Another related concept to HRQoL is *well-being*.

Measures of well-being typically assess the positive aspects of a person's life such as positive emotions and life satisfaction. Clinicians and public health officials have used HRQoL and well-being to measure the effects of chronic illness, treatments and short and long-term disabilities.

3.3.1 Instruments for measuring of health-related quality of life, created by WHO

The WHOQoL instruments are usually used for focusing on individuals' own views of their well-being; they provide a new perspective on disease. There are also tools that enable this type of research to be carried out.

WHO created complex questionnaire instrument that can assess quality of life in a variety of situations and population groups. In addition, modules are being developed to allow more detailed assessments of specific populations (cancer patients, refugees, the elderly people and those with certain diseases).

The practical use of this instrument can be in various fields:

- *in medical practice* - it may be used with other forms of assessment giving valuable information that can indicate areas in which a person is most affected and help the practitioner to make the best choices in patient care. In addition, it may be used to measure change in quality of life over the course of treatment;
- *improvement of the doctor - patient relationship* - by increasing the physicians' understanding of how disease affects patients' quality of life, the interaction between patient and doctor will change and improve. This gives more meaning and fulfilment to the work of doctors and leads to the patients being provided with more comprehensive health care;
- *in assessment the effectiveness and relative merits of different treatments* - this tool can form a part of the evaluation of treatments - for example chemotherapy for cancer may prolong a person's life, but may only do so at considerable cost to their quality of life. It enables to look at changes in the person's well-being over the course of treatment, a more complete picture can be gained;
- *in health services evaluation* - here it can provide an invaluable supplementary appraisal of health care services, by yielding a measure of the relationships between the health service and patients' quality of life and also directly presenting a measure of patients perception of the quality and availability of health care;

- *in research* - providing new insights into the nature of disease by assessing how disease impairs the subjective well-being of a person across the whole range of areas;
- *in policymaking* - monitoring of policy changes, evaluation of effect of policy to quality of life of people in contact with health services (*WHO, 1997*).

3.3.2 Another available instruments to measure HRQoL

The Health Measurements Research Group from University of Wisconsin has developed an overview of other possible measuring tools for HRQoL.

SF- 36 questionnaire

SF-36 is a multi-purpose, short-form health survey with only 36 questions. It yields an 8-scale profile of functional health and well-being scores as well as psychometrically based physical and mental health summary measures and a preference-based health utility index.

Over the years, the SF-36 has been used in surveys of general and specific populations, for comparing the relative burden of diseases across different sub-groups and in differentiating the health benefits produced by health care treatments. A newer version of the SF-36, was designed to make improvements to the original instrument.

EQ-5D questionnaire

The approach most commonly used in the European community is the EQ-5D. A collaborative group has advanced this method from Western Europe known as the EuroQol group. The group comprises a network of international, multi-disciplinary researchers, originally from seven centres in England, Finland, the Netherlands, Norway, and Sweden. More recently, researchers from Spain as well as researchers from Germany, Greece, Canada, the US and Japan have joined the group. The intention of this effort is to develop a generic currency for health that could be used across Europe.

QWB- SA (The Quality of Well-Being Scale) questionnaire

It has been used in numerous clinical trials and studies over the years to evaluate medical and surgical therapies in conditions such as chronic obstructive pulmonary disease, HIV, cystic fibrosis, diabetes mellitus, atrial fibrillation, lung transplantation, arthritis, end stage renal disease, cancer, depression, and several other conditions.

The self-administered form of the QWB (QWB - SA) has been developed more recently. It combines preference-weighted values for symptoms and functioning. Symptoms are assessed by questions that ask about the presence or absence of different symptoms or conditions. Functioning is assessed by a series of questions designed to record functional limitations over the previous three days, within three separate domains - mobility, physical activity, and social activity.

4 Objectives of the dissertation thesis

The primary aim:

- comprehensive evaluation of occupational stress and quality of life in chosen professions

The secondary aims:

- the assessment of occupational stress by available legislative methods (measured by the Meister questionnaire);
- the assessment of quality of life level in relation to performed profession (measured by the questionnaire WHOQoL-BREF 26);
- the development of objectification method for occupational stress using *salivary cortisol as an indicator of chronic stress*;
- overall evaluation of achieved results and recommendations for practice.

5 Material and methodology, statistical analyses

The performed study has a structure of a cross-sectional epidemiological study. In the beginning, references with similar features were collected in order to perform the best preparation of the thesis design (especially for collecting the saliva samples and their laboratory analysis). The overall duration of study performance and statistical analyses lasted from October 2010 till June 2013.

5.1 Population groups

As it is mentioned in the name of work, teachers at the 2nd levels of elementary schools were chosen as the main studied group. As a comparative group with same characteristic of performed profession (mainly professional physical and mental overload), firefighters were selected. However, we are well aware of incomparability of chosen occupations and of different stress response, which is here more acute than chronic. Before every entrance into the workplace, managements of schools and the Fire Rescue System were contacted by one of the responsible persons and informed about the main purposes of this study. In the same way, personal interview about main goals was discussed with every professional group. The volunteers signed the informed consent and at the same time, they obtained very simple instructions and information about how to collect data as best as possible.

5.2 Questionnaires

Two types of complex questionnaire were created - one for teachers and one for firefighters. Because of expansiveness of questionnaire, an independent person did recommended review and explicit deficiencies were corrected. The full text of this questionnaire is in the appendix of this work.

The first part included *basic socio-demographic information* about each respondent (gender, age, residency, marital status, number of children and position at work). In order to obtain the best data possible for salivary cortisol, detailed questions about their general health status with stating of drug using were asked.

The study was conducted using a standardized *questionnaire of the Meister*, which determines the self-perceived occupational stress. This tool gives information about differences in occupational psychic load perception in many professional groups.

It consists of ten questions that are divided into the three sections:

- *overload - time pressure, responsibility, interpersonal conflicts with problems at work;*
- *monotony - dissatisfaction, tedious and monotonous work;*
- *non-specific stress reaction - nervousness, fatigue, exhaustion, dissimilar work performance for longer time.*

Respondents expressed their subjective feelings which were assessed in scale 1- 5; “1 - no, I totally disagree”, “3 – undecided - sometimes yes, sometimes no” and “5 - yes, I agree fully”. The results are used for the group assessment. Then, the obtained data were compared with measured critical medians for every question, and calculated by the standard method for classification of grade of psychic overload.

The specific stressors of every profession were taken into account as well. The next part included questions about *their satisfaction with chosen profession, workplace and their relationships with colleagues and their self-assessment as professional workers.*

The last part of this questionnaire was *Czech version of Quality of Life- BREF 26* (translated by Dragomericka et al, 2006 from Prague Psychiatric Centre, Centre for Neuropsychiatric Studies) for which is standardized questionnaire from the World Health Organisation. There are 26 items divided into four domains: *physical health, psychological health, social relationships and environment.* They focus on population under 65 years. The shorter version was used because of its better convenience in large research studies or clinical trials.

5.3 Collection of biological material

A: The first step was verifying the saliva in practical applications.

The *start-up study* was performed in 10 health respondents. Based on these results, we could specify the time of sampling, collecting material, transport of collected biological material to laboratory, required material for every analytical method and storage temperature.

5.3.1 Device for saliva collecting

A Salivette Cortisol Tube was used as a collector of saliva in our respondents. It is used in research and for clinical examinations (or therapy monitoring) and in diagnoses. This type of collecting offers more advantages than collecting urine or blood. Usually, chewing a special roll (without citric acid as a stimulator of salivation) is not a problem.



Figure 5 Saliva collection tube - Salivette Cortisol (Adopted from Sarstedt)

B: Pilot study in real conditions was performed in the period August - November 2012, in approximately fifty respondents of every profession. Participants were given a sampling schedule.

The objectives were:

- *to find out a suitable analytical method for salivary cortisol* (See the chapter 5.4),
- *verification of drawn questionnaire,*
- *to keep circadian rhythm of cortisol in working population by quality collection of samples during the busiest working day in teachers* (in firefighters, collecting was proceeded on a day without real emergency situation).

•

Time sampling schedule in teachers:

- *7 a.m. (to 30 minutes after awakening);*
- *11 a.m. (after the first phase of teaching process);*
- *3 p.m. (after work performance);*
- *10 p.m. (before sleeping);*
- *7 a.m. (to 30 minutes after awakening).*

Time sampling schedule in firefighters:

- 7 a.m. (to 30 minutes after awakening);
- 2 p.m. - 3 p.m. (immediately and one hour after unannounced exercise);
- 10 p.m. (before sleeping);
- 7 a.m. (to 30 minutes after awakening).

Basic instruction contained rules for saliva collection, and these were:

- *not to brush teeth before collecting saliva,*
- *no eating, no alcohol, no smoking, no chewing gums,*
- *not to perform physical activity during collection*
- *rinsing food residues by water was allowed.*

C: Main epidemiological study was enriched by about one hundred respondents. Time of sampling and questionnaire content stayed in original version.

5.4 Analytical procedures used

One of the important goals of the pilot study was verification of more suitable analytical methods for salivary cortisol. In accordance to the international references, *LC-MS/MS (liquid chromatography - tandem mass spectrometry)* and *RIA (radioimmunoanalysis)* are the most used methods.

5.4.1 SPE method (solid phase extraction for liquid chromatography - tandem mass spectrometry)

A: SPE material for processing

SPE tubes Strata X (30mg/1ml) for sample clean up were used.



Figure 6 Strata X Tubes for SPE (Adapted from Phenomenex Inc., CA USA)

B: SPE Sample Preparation

- conditioning (1ml of methanol followed by 1 ml of water);
- loading (500µl of saliva);
- rinsing - 1ml water followed by 1 ml of 40% methanol in water
- evaporating - under nitrogen stream
- reconstituting in acetonitrile/water before injection on HPLC column

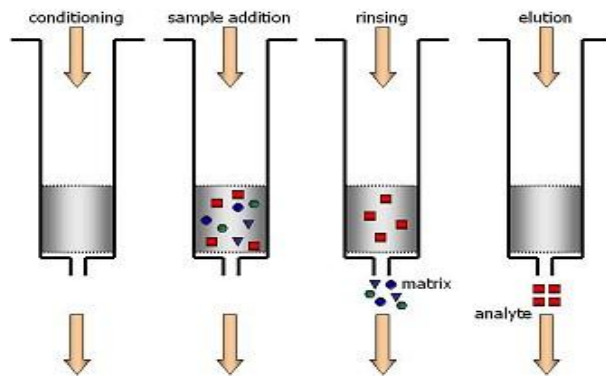


Figure 7 A typical SPE sequence (Adapted from Phenomenex Inc, CA USA)

5.4.2 RIA method (radioimmunoanalysis)

Test principle RIA

RIA tests are competitive ligand assays for antibody and antigen determination. These tests are performed in coated tubes. The specific radioactive *tracer* I_{125} was carried into pipetted saliva and incubated for one hour. Then the tracer was removed and samples were prepared for evaluation. The qualitative evaluation of antigen/antibody concentration was carried out using a calibration curve.

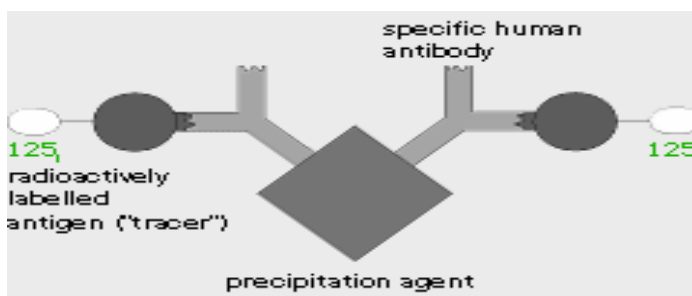


Figure 8 A typical principle of radioimmunoassay with labelled antigen

(Adopted from EUROIMMUN Medizinische Labordiagnostika)

5.5 Statistical analyses

Analyses were carried out using IBM SPSS Statistics version 20 (SPSS Inc., Chicago, IL, USA). Means and standard deviation (SD) were used in descriptive statistics. In all analyses, cortisol values were transformed using the natural logarithm (ln) due to skewed data. The results are also presented as back-transformed values. Diurnal cortisol level (slope) was measured as the difference between morning and evening saliva cortisol. The ratio (the relative counterpart of the slope) was defined as the ratio between evening and morning values. Area under the curve with respect to ground and AUC_i were calculated according to *Pruessner et al. (2003)*. Population intervals were calculated within mean \pm 1.96 SD. These intervals were then transformed back into nmol/l values. Confidence intervals were calculated within mean \pm 1.96 SEM. These intervals were then transformed back into nmol/l. To analyse occupational differences, regression analysis was performed, with post hoc tests for group comparisons. The outcome was Ln-transformed cortisol values. Explanatory variables were occupational group and gender (three categories: women teachers, men teachers, and men firefighters), age, physical activity, and smoking status. All tests were two-sided and statistical significance was set at $p < 0.05$.

Example of obligatory unannounced physical exercise of firefighters



6 Results of the study

After the personal anamnesis evaluation and exclusion criteria, 145 respondents of elementary school teachers and 136 respondents of firefighters were included to the study. Eight teacher respondents were excluded because of positive corticosteroids treatment. Seven firefighter respondents refused to enter the study and one respondent exited the study voluntarily. Due to the different nature of work performance at the firefighters' department, nine women were eliminated from analyses.

6.1 Basic characteristics of the tested groups

Mostly women teachers (72%) represented group of teachers; smaller percentage were men teachers (28%). The average age was approximately 41.6 years [CI 95% 39.8; 43.3], where men were older - 45.0 years [CI 95% 41.1; 48.6] and women were younger - 40.3 years [CI 95% 39.8; 43.4]. By age group distribution, teacher respondents younger than 40 years had a lower proportion - 46% of the respondents to group of older than 40 years- 54% of the respondents. 59% of respondents graduated from faculties of education; 37% of respondents reached other than pedagogical education and 4% of the respondents consisted of teachers with only high school education.

Only men formed the group of firefighters. Their average age was about 37.0 years [CI 95% 34.8; 37.6]. According to age groups, 64% of the respondents were younger than 40 years and 36 of the respondents were older than 40 years. Concerning the question of education, 81% completed high school education and 19% of them had university degree.

More detailed data about socio-demographic characteristics about both professional groups are shown in Tables 1, 2, 3.

Table 1 The description of demographic data about respondents of both professional groups according to gender, age and length of practice

Demographic variable	Teachers			Firefighters	p- value
	all group (N=142)	women (N=102)	men (N=40)	men (N=136)	
	Mean ± SD	Mean ± SD	Mean ±SD	Mean ±SD	
Age	41.6 ±10.73	40.3±10.11	45.0±11.69	36.2 ± 8.19	p< 0.001
length of practice	15.5±10.39	14.4± 9.79	18.4± 9.79	12.5 ±8.59	p< 0.007

Table 2 The description of demographic data about respondents of both professional groups according to place of residence, educational level and marital status

	Teachers (N=142)		Women (N=102)		Men (N=40)		Firefighters (N=136)	
	N	%	N	%	N	%	N	%
Place of residence								
City	5	3.0%	2	2.0%	3	8.0%	19	14.0%
Town	79	56.0%	59	58.0%	20	50.0%	46	34.0%
Village	58	41.0%	41	40.0%	17	42.0%	71	52.0%
Educational level								
High school education	6	4.0%	0	0.0 %	6	15.0%	110	81.0%
Bachelor's university degree	0	0.0%	0	0.0%	0	0.0%	11	8.0%
Master's university degree	136	96.0%	102	100%	34	85.0%	15	11.0%
Marital status								
Married	97	68.0%	67	66.0%	30	75.0%	81	60.0%
Single	14	10.0%	9	9.0%	5	13.0%	18	13.0%
Divorced	22	16.0%	18	17.0%	4	10.0%	29	21.0%
Widowed	2	1.0%	2	2.0%	1	2.0%	2	2.0%
Partner	7	5.0%	6	6.0%	0	0.0%	6	4.0%

Table 3 The description of demographic data about respondents of both professional groups according to smoking status and physical activity

	Teachers (N=142)		Women (N=102)		Men (N=40)		Firefighters (N=136)	
	n	%	n	%	n	%	N	%
Smoking status								
Smoker	20	14.0%	14	14.0%	6	15.0%	19	14.0%
Non-smoker	122	86.0%	88	86.0%	34	85.0%	117	86.0%
Physical activity								
≥4 days/week	87	61.0%	69	68.0%	18	55.0%	37	27.0%
>1day or <4days/week	54	38.0%	32	31.0%	22	45.0%	98	72.0%
<2 days/week	1	1.0%	1	1.0%	0	0.0%	1	1.0%

6.2 Assessment of the Meister Questionnaire by the standard method

Assessment of critical medians is included in standard procedure provided by law. According to this fact, the critical medians were more exceeding in items “time pressure, responsibility, exhaustion, fatigue and decrease of long work performance” in teachers than in firefighters. In teachers’ group, the results are shown to statistical significance in question 3 “responsibility” between age groups ($p= 0.028$); in question 10 “decrease of long work performance” between women and men ($p=0.037$), with worse perception in women teachers. The final grade for this profession was 2- possibility of regular occurrence of temporary influencing of subjective status or more precisely effectiveness (see Table 4).

Table 4 The assessment of the Meister Questionnaire of teachers by a standard assessment method

Teachers (N=142)	whole set				<40 years	≥ 40 years	p-value	critical value of medians
		women	men	p-value				
FACTOR I. (OVERLOAD)								
Time pressure	3	3,5	3	0.064	3	4	0.251	3
Responsibility	3	3	3	0.520	3	3	0.028	3
Interpersonal conflicts	2	2	2	0.429	2	2	0.137	2,5
FACTOR II. (MONOTONY)								
Dissatisfaction	2	2	2	0.094	2	2	0.089	2,5
Tedious work	2	1	2	0.064	2	2	0.312	2,5
Monotony	1	1	1	0.124	1	1	0.172	2,5
FACTOR III. (STRESS FACTOR)								
Nervousness	2,5	2	3	0.966	2	3	0.296	3
Exhaustion	3	3	3	0.386	3	3	0.116	3
Fatigue	3	3	3	0.814	3	3	0.139	3
Decrease of long work performance	4	4	3	0.037	4	3	0.432	2,5
Final degree:	2	2	2		2	2		

In firefighters' group, it was about differences between age groups only, and these were in question 4 "tedious work" (p= 0.040), question 7 "nervousness (p= 0.031) and in question 10 "decrease of long work performance" (p=0.017). In the process of classification in firefighters, this professional group reached grade 1- level of stress, at which the health damage or affection of subjective state or effectiveness are not likely to appear (see Table 5).

Table 5 The assessment of the Meister Questionnaire of firefighters by a standard assessment method

Firefighters (N=136)	whole set	<40 years	≥ 40 years	p-value	critical value of medians
FACTOR I. (OVERLOAD)					
Time pressure	3	3	3	0.852	3
Responsibility	2	2	2	0.972	3
Interpersonal conflicts	1	1	1	0.784	2,5
FACTOR II. (MONOTONY)					
Dissatisfaction	1	1	1.5	0.070	2,5
Tedious work	1	1	1	0.040	2,5
Monotony	1	1	1	0.658	2,5
FACTOR III. (STRESS FACTOR)					
Nervousness	1	1	2	0.031	3
Exhaustion	1	1	1	0.190	3
Fatigue	1	1	1.5	0.628	3
Decrease of long work performance	1	1	2	0.017	2,5
Final degree:	1	1	1		

Table 6 The comparison of the answers for particular items of the Meister Questionnaire in both professional groups (expressed in percentage)

Items	Firefighters			Teachers			p-value
	no	I don't know	yes	no	I don't know	yes	
FACTOR I. (OVERLOAD)							
Time pressure	37.5%	46.3%	16.2%	11.3%	43.0%	45.7%	<0.001
Responsibility	69.2%	19.1%	11.7%	31.7%	35.2%	33.1%	<0.001
Interpersonal conflicts	94.1%	5.9%	0.0%	68.3%	26.1%	5.6%	<0.001
FACTOR II. (MONOTONY)							
Dissatisfaction	89.7%	3.7%	6.6%	67.6%	27.5%	4.9%	<0.001
Tedious work	95.6%	3.7%	0.7%	77.5%	16.9%	5.6%	<0.001
Monotony	94.9%	5.1%	0.0%	90.2%	5.6%	4.2%	0.015
FACTOR III. (STRESS FACTOR)							
Nervousness	89.0%	10.3%	0.7%	50.0%	35.2%	14.8%	<0.001
Exhaustion	94.1%	3.7%	2.2%	42.2%	41.5%	16.2%	<0.001
Fatigue	86.0%	8.8%	5.1%	27.5%	41.5%	31.0%	<0.001
Decrease of long work performance	78.7%	11.8%	9.5%	21.8%	27.5%	50.7%	<0.001

Table 6 demonstrates the comparison of answers for particular items of the Meister Questionnaire. The answer “no” means evaluation of the answers 1, 2; the answer “I don’t know” expresses “sometimes yes, sometimes no”; the answer “yes” means joint evaluation of the answers 4, 5. From the achieved results, worse perception of occupational stress in teachers than in firefighters is visible.

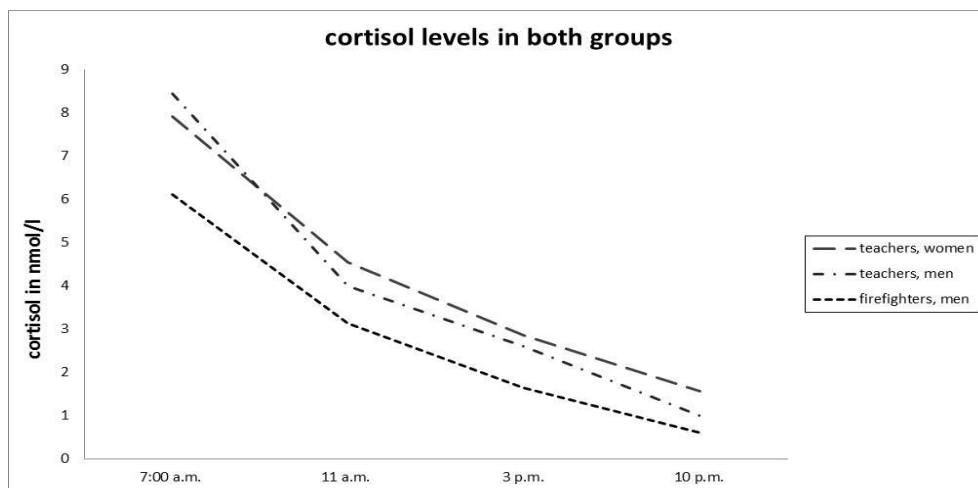
In the item “monotony”, the respondents did not consider their profession monotonous but quite diverse and varied from many sides (especially in the group of firefighters where the satisfaction was 94.9%).

6.3 The assessment of occupational stress by salivary cortisol

6.3.1 The evaluation of cortisol profile from the perspective of profession

As seen in the Figure 1, concentration of cortisol reaches the highest values in the morning and the lowest concentration around 22 p.m. to midnight. This model seems to be consistent with a normal circadian rhythm of cortisol in general. Between teachers, rough estimated cortisol rhythm during all day is identical. Firefighters have lower concentration in comparison with teachers and this means different cortisol curve.

Figure 1 Diurnal cortisol rhythm in teachers and firefighters



6.3.2 The evaluation of the individual cortisol measurements in both professional groups (Adjusted to confounder factors)

In Table 7, the average salivary cortisol concentrations in every professional group are shown. Teacher respondents exhibited higher values in every measurement. Statistically significant difference was proved in every measurement ($p < 0.001$).

Table 7 The average concentrations of salivary cortisol in both professional groups

Concentration in nmol/l	Teachers		Firefighters		
	Mean	95% CI	Mean	95% CI	p- value
morning cortisol sample	7.69	(7.242, 8.264)	5.64	(5.296, 6.061)	0.000
evening cortisol sample	0.27	(0.187, 0.386)	0.18	(0.126, 0.265)	0.001
diurnal slope	6.42	(5.906, 6.986)	5.05	(4.618, 5.479)	0.000
Ratio	0.02	(0.02, 0.05)	0.03	(0.02, 0.04)	0.010
AUC(g)	48.42	(29.341, 54.434)	33.44	(30.938, 36.161)	0.000
AUC(i)	31.19	(29.165, 34.636)	25.03	(23.034, 27.248)	0.000

6.3.3 The evaluation of the individual cortisol level measurements according to gender and age

In accordance with the values listed in Table 8, morning and evening salivary cortisol concentrations in both groups were within normal physiological range.

In teachers (both women and men), morning cortisol level was at the same level; compared to men teachers - men firefighters, where the statistical significance was confirmed ($p < 0.001$).

Evening cortisol levels were statistically higher in men teachers than in women teachers ($p = 0.010$), also in men teachers and men firefighters ($p = 0.011$).

The measured cortisol slope was in teachers on similar basis, firefighters' value was lower compared to the one of men teachers' ($p = 0.042$).

The level of ratio (between evening and morning cortisol levels) indicates better health condition for values close to zero. In our case, women teachers had statistically lower values than men teachers ($p = 0.014$).

Total output of cortisol (AUC_g) appeared to be higher in men teachers than in women teachers; in comparison with men firefighters, the teachers had significantly lower output (p<0.001).

Reactivity to changes in cortisol curve (AUC_i) was at similar level in all groups.

Table 8 Concentrations of salivary cortisol in both professional groups according to gender (in nmol/l)

concentration (nmol/l)	Teachers (women: N=102; men=40)				women men	Firefighters (Men: N=136)		Men teachers + firefighters
	women	95% CI	men	95% CI	p-value	men	95% CI	p-value
morning cortisol sample	7.9	(6.42; 9.59)	8.2	(6.49; 10.22)	0.629	6.1	(4.96; 7.43)	< 0.001
evening cortisol sample	0.2	(0.05; 0.49)	0.5	(0.14; 1.62)	0.010	0.2	(0.05; 0.48)	0.011
diurnal slope	6.4	(4.96; 8.38)	6.6	(4.93; 8.93)	0.768	5.4	(4.13; 7.02)	0.042
ratio	0.02	(0.007; 0.06)	0.05	(0.017; 0.20)	0.014	0.02	(0.009; 0.07)	0.061
AUC _g	48.4	(38.98; 60.94)	57.4	(44.25; 74.44)	0.064	37.8	(29.13; 46.06)	< 0.001
AUC _i	35.2	(27.60; 45.24)	33.8	(25.80; 44.88)	0.679	28.5	(22.19; 36.60)	0.067

With respect to the age groups, higher evening cortisol concentrations and ratio values were recorded only in the teaching profession and statistical significance was visible in older respondents (Table 9). In firefighters, no differences based on age were observed (Table 10).

Table 9 Concentrations of salivary cortisol in teachers' groups according to age groups
(in nmol/l)

	Teachers <40 years=65; ≥ 40years= 77			Women 40 years=50; ≥ 40years= 52			Men <40 years=15; ≥ 40years= 25		
	< 40years	≥40 years	P-value	< 40 years	≥40 years	P-value	< 40 years	≥40 years	P-value
concentration (nmol/l)									
morning cortisol sample	7.61	7.76	0.778	7.61	7.92	0.617	7.62	1.13	0.805
evening cortisol sample	0.17	0.37	0.041	0.12	0.27	0.113	0.50	0.84	0.470
diurnal slope	6.48	6.36	0.806	6.68	6.55	0.836	5.81	5.95	0.850
ratio	0.02	0.05	0.045	0.02	0.03	0.134	0.06	0.11	0.432
AUC(g)	45.60	50.91	0.169	42.94	50.40	0.087	56.20	51.78	0.542
AUC(i)	31.50	31.82	0.924	32.14	32.78	0.877	29.81	29.65	0.903

Table 10 Concentrations of salivary cortisol in firefighters according to age groups (in nmol/l)

	Firefighters (<40 years=87; ≥ 40years= 49)		
	< 40 years	≥40 years	p-value
concentration (nmol/l)			
morning cortisol sample	5.81	5.36	0.340
evening cortisol sample	0.18	0.19	0.797
diurnal slope	5.15	4.76	0.341
Ratio	0.03	0.04	0.635
AUC(g)	33.45	33.11	0.891
AUC(i)	25.53	24.05	0.473

6.3.4 The evaluation of the individual cortisol measurements according to smoking status and physical activity

Smoking and physical activity belong among the biggest confounding factors for salivary cortisol.

Smoking

In our study, both professional groups are mostly non-smokers, smokers represented very small percentage. As shown in Table 11, negative effect of smoking among teachers was not statistically significant. In firefighters, statistical difference between smokers and non-smokers (Table 12) was proved in the morning cortisol levels ($p=0.036$) and in overall hormonal output AUC_g ($p=0.013$).

Table 11 Concentrations of salivary cortisol in teachers' groups according to smoking status
(in nmol/l)

concentration (nmol/l)	Teachers (smoker=20; non-smoker= 122)			Women (smoker=14; non- smoker= 88)			Men (smoker=6; non- smoker= 34)		
	smoker	non smoker	p-value	smoker	non smoker	p-value	smoker	non smoker	p-value
morning cortisol sample	7.63	8.44	0.287	7.70	8.71	0.287	7.46	7.81	0.749
evening cortisol sample	0.29	0.18	0.450	0.21	0.100	0.318	0.68	0.76	0.895
diurnal slope	6.34	7.06	0.352	6.53	7.50	0.345	5.87	6.11	0.804
Ratio	0.02	0.05	0.353	0.02	0.01	0.242	0.09	0.10	0.935
AUC(g)	48.52	49.30	0.890	46.80	46.80	47.32	53.25	54.22	0.923
AUC(i)	31.46	32.81	0.731	32.40	33.15	0.884	29.25	32.14	0.623

Table 12 Concentrations of salivary cortisol in firefighters according to smoking status
(in nmol/l)

concentration (nmol/l)	Firefighters (smoker=19; non-smoker= 117)		
	Smoker	Non-smoker	p-value
morning cortisol sample	4.73	5.83	0.036
evening cortisol sample	0.09	0.20	0.113
diurnal slope	4.36	5.15	0.129
Ratio	0.02	0.02	0.235
AUC(g)	26.28	34.88	0.013
AUC(i)	21.24	25.74	0.094

Physical activity

In terms of physical activity, no statistically significant changes in cortisol concentrations were shown. Teachers had, in comparison with firefighters, higher values in all measurements (Table 13). In addition, between women and men teachers were no significant differences (Table 14).

Table 13 Concentrations of salivary cortisol in both professional groups according to physical activity (in nmol/l)

concentration (nmol/l)	Teachers (N=142)				Firefighters (N=136)			
	6-7x/week (87)	3-5x/week (54)	2 and less/week (1)	p-value	6-7x/week (37)	3-5x/week (98)	2 and less/week (1)	p-value
morning cortisol sample	7.83	7.52	13.00	0.340	6.35	5.43	1.69	0.143
evening cortisol sample	0.30	0.23	0.01	0.321	0.18	0.18	0.60	0.835
diurnal slope	6.42	6.39	12.909	0.346	5.75	4.80	4.82	0.107
Ratio	0.03	0.03	0.007	0.245	0.03	0.03	0.11	0.721
AUC(g)	49.75	46.62	69.47	0.547	35.16	32.88	36.05	0.753
AUC(i)	32.10	30.51	69.27	0.258	26.47	24.51	26.39	0.854

Table 14 Concentrations of salivary cortisol in teachers according to physical activity for both genders (in nmol/l)

concentration (nmol/l)	Women teachers (N=102)				Men teachers (N=40)			
	6-7x/week (69)	3-5x/week (32)	2 and less/week (1)	p-value	6-7x/week (18)	3-5x/week (22)	2 and less/week (0)	p-value
morning cortisol sample	7.96	7.43	13.00	0.340	7.34	7.65	0.00	0.691
evening cortisol sample	0.23	0.13	0.01	0.266	0.88	0.57	0.00	0.488
diurnal slope	6.67	6.48	12.91	0.415	5.55	6.19	0.00	0.362
Ratio	0.03	0.02	0.007	0.236	0.11	0.07	0.00	0.429
AUC(g)	48.42	43.16	69.47	0.402	60.28	52.10	0.00	0.666
AUC(i)	32.45	30.43	69.27	0.320	29.25	30.02	0.00	0.850

6.3.5 The evaluation of the mental subjective perception (the Meister Questionnaire with cortisol measurements)

For the purposes of the efficiency of the Meister Questionnaire survey, depth regression analysis of particular items of questionnaire with salivary cortisol measurements was carried out just for teaching profession.

Factor I. Overload

In teaching profession, no significant influence of cortisol measurements by items of this factor was recorded. The exception is the question “*big responsibility*” (Table 15), which significantly affected cortisol slope ($p= 0.033$).

With respect to gender, the results were more significant in women teachers, where the value of ratio ($p=0.046$) is indicating higher probability of chronic stress in the answers “I don’t know”. In firefighters, no differences were found.

Tab 15 The results of the regression analysis of univariate data (Item I. - Overload and cortisol measurements) in teachers

FACTOR I.	concentration (nmol/l)		morning cortisol sample	evening cortisol sample	diurnal slope	ratio	AUC(g)	AUC(i)
1. time pressure	mean	yes	7.92	0.86	6.30	0.04	51.94	34.47
		no	8.50	0.51	6.82	0.03	46.99	29.96
		I don't know	7.54	0.58	5.81	0.05	39.65	29.30
	p-value		0.519	0.630	0.269	0.609	0.109	0.300
3. responsibility	mean	yes	7.85	0.21	7.17	0.04	46.06	32.46
		no	7.69	0.25	7.31	0.10	50.40	34.47
		I don't know	7.06	0.35	5.41	0.11	45.15	27.39
	p-value		0.382	0.594	0.033	0.192	0.482	0.110
5. interpersonal conflicts	mean	yes	7.77	0.36	6.95	0.04	40.47	30.57
		no	7.32	0.57	6.42	0.08	46.99	30.88
		I don't know	8.25	1.21	6.88	0.14	55.14	32.46
	p-value		0.299	0.263	0.708	0.364	0.106	0.883

Factor II. Monotony

According to the results obtained in Table 16, monotony was clearly not reflected in cortisol concentrations in teachers. In addition, there were no differences between men and women.

In firefighters, cortisol values were statistically significant in the question “*dissatisfaction*” in morning cortisol value ($p=0.05$), in cortisol slope ($p=0.040$), in overall hormonal output ($p=0.039$) and in total reactivity ($p=0.007$).

Tab 16 The results of the regression analysis of univariate data (Item II. - Monotony and cortisol measurements) in teachers

FACTOR II.	concentration (nmol/l)	morning cortisol sample	evening cortisol sample	diurnal slope	ratio	AUC(g)	AUC(i)	
2. dissatisfaction	mean	yes	6.96	0.90	6.17	0.12	40.45	20.49
		no	7.46	0.50	6.82	0.06	50.91	33.45
		I don't know	7.54	0.57	6.17	0.07	51.94	31.19
	p-value		0.882	0.844	0.658	0.801	0.467	0.090
4. tedious work	mean	yes	8.00	0.39	6.75	0.04	54.60	35.87
		no	7.61	0.74	6.05	0.16	44.70	25.03
		I don't know	7.77	0.49	6.35	0.07	44.26	24.05
	p-value		0.940	0.709	0.846	0.272	0.613	0.220
6. monotony	mean	yes	6.69	1.51	4.75	0.22	47.47	21.12
		no	7.92	0.30	6.62	0.04	47.94	30.27
		I don't know	7.46	0.55	6.50	0.06	47.95	33.45
	p-value		0.581	0.343	0.353	0.287	1.00	0.247

Factor III. Non-specific stress reaction

The last part of the questionnaire deals with non-specific stress responses. The statistically significant changes were observed mainly in question “*exhaustion*”, where the difference was found in almost all cortisol measurements (Table 17). Thus, we can consider assumption that exhaustion may contribute to higher chronic stress exposure among teachers.

Women teachers clearly exceeded men teachers in these cortisol measurements: morning cortisol values ($p=0.023$), cortisol slope ($p=0.016$), ratio ($p=0.026$) and AUC (g) $p=0.015$. In item 10, women teachers had significantly higher values in comparison to men teachers in all cortisol measurements, too.

In firefighters, changes in measured concentrations of cortisol were not significant.

Tab 17 The results of the regression analysis of univariate data (Item III. – Non- specific stress reaction and cortisol measurements) in teachers

FACTOR III.	concentration (nmol/l)	morning cortisol sample	evening cortisol sample	diurnal slope	ratio	AUC(g)	AUC(i)	
7. nervousness	mean	yes	7.85	0.84	6.04	0.11	54.60	32.46
		no	7.69	0.34	6.89	0.04	50.90	35.16
		I don't know	7.85	0.89	6.23	0.10	55.15	51.46
	p-value		0.987	0.157	0.536	0.167	0.547	0.240
8. exhaustion	mean	yes	7.17	1.42	5.64	0.09	54.60	33.12
		no	7.17	0.32	5.93	0.03	50.40	24.78
		I don't know	9.12	0.55	7.77	0.03	55.15	37.34
	p-value		0.003	0.190	0.005	0.134	0.003	0.017
9. fatigue	mean	yes	8.67	0.78	7.10	0.09	54.60	31.50
		no	7.10	0.58	5.87	0.08	55.15	34.47
		I don't know	7.77	0.56	6.23	0.07	52.98	31.19
	p-value		0.244	0.861	0.437	0.927	0.864	0.710
10. decrease of long work performance	mean	yes	7.24	0.18	6.05	0.02	61.56	29.08
		no	7.92	0.42	6.62	0.05	42.95	33.12
		I don't know	8.41	0.41	7.03	0.05	60.35	35.52
	p-value		0.098	0.108	0.257	0.208	0.001	0.139

6.4 Evaluation of profession, factors of working environment and relationships

An essential part of the complex evaluation is an expression of how our respondents are satisfied with the chosen profession, their workplace and relationships. Table 18 has demonstrated that approximately 82.4% of teachers are satisfied with their profession. We can also see a statistical significance between men and women teachers ($p=0.007$). However, demands of this occupation are handled by only 39.4% of respondents ($p=0.033$).

Tab 18 Evaluation of profession and workplace in teachers (expressed in %)

Question 1-8	Teachers (N=142)			Women teachers (N=102)			Men teachers (N=40)			p- value
	yes	no	I don't know	yes	no	I don't know	yes	no	I don't know	
1. satisfaction with chosen profession	82.4%	2.8%	14.8%	83.4%	2.9%	13.7%	80%	2.5%	17.5%	0.007
2. satisfaction with prestige of workplace	67.0%	8.4%	24.6%	67.7%	5.8%	26.5%	65%	15%	20%	0.439
3. your personal relation to school management	58.5%	19.7%	21.8%	60.8%	19.6%	19.60%	52.5%	20%	27.5%	0.147
4. your personal relation to colleagues	81.6%	5.6%	24.6%	82.5%	4.0%	13.7%	80%	10%	10%	0.519
5. your personal relation in teaching staff	82.4%	1.4%	16.2%	82.3%	2.0%	15.7%	82.5%	0%	17.5%	0.947
6. cooperation with pupils	49.3%	12.7%	38.0%	49.0%	11.8%	39.2%	50%	15%	35%	0.800
7. cooperation with parents	62.0%	10.5%	27.5%	63.7%	9.8%	26.5%	57.5%	12.5%	30%	0.875
8. handling demands of profession	39.4%	34.5%	26.1%	44.1%	26.5%	29.4%	55%	27.5%	17.5%	0.033

In comparison, firefighters expressed 100%-s satisfaction with chosen profession. Accordingly, with this state, handling demands was assessed in positive way - 95.0% respondents are able to meet the conditions for their work performance (Table 19).

In Table 20, two of the most important questions (1, 8) were taken into account, the statistically significant difference ($p=0.000$) between both professions was confirmed.

Tab 19 Evaluation of profession and workplace in firefighters (expressed in %)

Question 1-8	Firefighters (N=136)		
	yes	no	I don't know
1. satisfaction with chosen profession	100%	0.0%	0.0%
2. satisfaction with prestige of workplace	94.8%	3.0%	2.2%
3. your personal relation to the Fire Rescue management	86.1%	8.8%	5.1%
4. your personal relation to colleagues	97.0%	0.0%	3.0%
5. your personal relations at Fire Department	82.4%	5.8%	11.8%
6. cooperation with emergency services	86.0%	8.8%	5.2%
7. cooperation with inhabitants	80.1%	5.1%	14.7%
8. handling demands of chosen profession	94.8%	0.7%	4.5%

Tab 20 The comparison of the answers between both professional groups (expressed in %)

Question 1,8	Teachers (N=142)			Firefighters (N=136)			p- value
	yes	no	I don't know	yes	no	I don't know	
1. profession choice	82.4%	2.8%	14.8%	100%	0.0%	0.0%	0.000
2. handling profession demands	39.4%	34.5%	26.1%	94.8%	0.7%	4.5%	0.000

6.5 Personality assessment as a professional worker

This part consists of questions about self-assessment of our respondents as professional workers in their professions. The first questions focused on handling attributes for work performance and motivation to work.

Both professions have similar results regarding the basic attributes for work performance, without statistical significance (Table 21).

On the other hand, in the question about motivation for work performance, the statistical significance was recorded ($p=0.000$). Teachers showed less motivation than firefighters - only 26.0% of teachers had positive approach and 44.4% of teachers had negative approach (Table 22).

Tab 21 Predispositions to work performance in both professional groups (expressed in %)

	yes	no	p-value
Teachers (N=142)	99.3%	0.7%	0.328
Firefighters (N=136)	100%	0.0%	

Tab 22 Motivation to work performance in both professional groups (expressed in %)

	yes	no	averaged	not assessed	p-value
Teachers (N=142)	26.0%	44.4%	25.4%	4.2%	0.000
Firefighters (N=136)	39.7%	18.4%	37.5%	4.4%	

In Table 23, self-perception of our respondents as professionals is shown. It is evident that respondents assume their professionalism (it is proved by higher percentage in the answer “yes”). The answer “average” was chosen more often by firefighters. The statistical significance was proved in variables: “*professionalism*” ($p=0.000$), “*natural authority*” ($p=0.000$), “*management skills*” ($p=0.000$) and “*communication skills*” ($p=0.000$).

Tab 23 Self- assessments of respondents as professionals in both professional groups
(expressed in %)

	Teachers (N=142)			Firefighters (N=136)			p-value
	yes	no	averaged	yes	no	averaged	
1. professionalism	86.6%	0.0%	13.4%	74.2%	0.8%	25.0%	0.000
2. natural authority	75.3%	0.8%	23.9%	48.6%	2.9%	48.5%	0.000
3. management skills	65.5%	2.8%	31.7%	47.1%	5.1%	47.8%	0.000
4. sense for equity	95.1%	0.7%	4.2%	89.0%	0.0%	11.0%	0.143
5. communication skills	89.4%	1.4%	9.2%	61.8%	3.7%	34.5%	0.000
6. patience	81.0%	1.4%	17.6%	82.4%	1.5%	16.1%	0.688
7. friendly approach	84.5%	1.4%	14.1%	88.3%	0.0%	11.7%	0.643
8. consistency	77.5%	0.7%	21.8%	79.4%	1.5%	19.1%	0.801
9. stringency	78.9%	1.4%	19.7%	88.2%	2.9%	8.9%	0.790

In accordance with gender in teachers, men teachers had much better attitude (more positive answers) in all asked questions compared to women teachers (Table 24). The statistical significance was recorded in these items: “*natural authority*” (p=0.008); “*management skills*” (p=0.051) and “*stringency*” (p=0.052).

Tab 24 Self- assessments in teachers as professionals (according to gender; expressed in %)

	Women teachers (N=102)			Men teachers (N=40)			p-value
	yes	no	averaged	yes	no	averaged	
1. professionalism	85.3%	0.0%	14.7%	85.0%	0.0%	15.0%	0.754
2. natural authority	69.6%	0.0%	30.4%	85.0%	2.5%	7.5%	0.008
3. management skills	58.8%	3.0%	38.9%	82.5%	2.5%	15.0%	0.051
4. sense for equity	95.1%	0.0%	4.9%	95.0%	2.5%	2.5%	0.108
5. communication skills	89.2%	1.0%	9.8%	90.0%	2.5%	7.5%	0.607
6. patience	82.4%	0.0%	17.6%	77.5%	5.0%	17.5%	0.203
7. friendly approach	84.4%	1.0%	14.6%	85.0%	2.5%	12.5%	0.488
8. consistency	79.4%	0.0%	20.6%	72.5%	2.5%	25.0%	0.293
9. stringency	76.5%	1.0%	22.5%	90.0%	0.0%	10.0%	0.052

6.6 Other stressful situations and coping

One of the situations, which can adversely affect work performance, is a negative event of any kind. From Table 25 it is obvious that teachers experienced more negative events (35.2% of respondents) than firefighters (9.6% of respondents), where the statistical significance was recorded $p=0.000$. The problems most complained about: *long-lasting financial problems together with family problems*. The problems less complained about: *disease or death in family*.

In firefighters, main problems were in similar line than in teachers, but not in abundant number than in this profession.

Tab 25 Negative event affecting work performance in both professional groups (expressed in %)

	yes	no	p-value
Teachers (N=142)	35.2%	64.8%	0.000
Firefighters (N=136)	9.6%	90.4%	

From the view of gender, a frequency of answers between men and women was in the same level (Table 26) without any statistical difference ($p=0.974$). From each possibility, dominant responses were again *financial and family problems, the diseases and deaths in family*.

Tab 26 Negative event affecting work performance in teachers (according to gender; expressed in %)

	yes	no	p-value
Women teachers (N=102)	35.3%	64.7%	0.974
Men teachers (N=40)	35.0%	65.0%	

Today, bullying teachers by pupils is a delicate matter in teaching profession. In our group of teacher respondents, we had 13 cases - it means 9.2%. In women teachers, it was 8 cases (7.8%) and 5 cases (12.5%) in men teachers. The statistical significance was not confirmed (Table 27).

Tab 27 Bullying teachers by pupils (expressed in %)

	yes	no	p-value
Teachers (N=142)	9.2%	90.8%	
Women teachers (N=102)	7.8%	92.2%	0.518
Men teachers (N=40)	12.5%	87.5%	

Social support appears to be significantly protective factor for better coping with stressful situations. In table 28 it is visible that both professional groups have some support. Firefighters appeared to have more support (91.9%) than teachers did (69.7%), (p=0.000). In the context of gender, distribution was at the same level (p=0.963).

In both professions, the biggest support was in *wife/husband, children, and colleagues*. There were some cases when respondents turned to *faith and religion*.

Tab 28 Social support in both professional groups (expressed in %)

	yes	no	p-value
Teachers (N=142)	69.7%	30.3%	0.000
Firefighters (N=136)	91.9%	8.1%	
Women teachers (N=102)	69.4%	30.6%	0.963
Men teachers (N=40)	70.0%	30.0%	

In this section, we were interested in dealing with stressful reactions. As noted below in Table 29, the techniques most used for coping in teachers are *hobby (69.0%) and various kinds of relaxation (77.5%)*. Interesting fact is that some small percentage of teachers also marked a possibility of *taking of medications for sleeping (12.7%) or sedatives (5.6%)*. In firefighters, no drug use was recorded (0.0% in both cases). This state was statistically significant (p=0.000; p=0.005). Regardless to gender (Table 30), men teachers preferred their *hobby* more (*85.0%*) than women teachers (p=0.010). From the negative aspects, men teachers *smoked* more and it had statistical significance (p=0.033).

Tab 29 Coping with stressful situations in both professional groups (expressed in %)

	Teachers (N=142)		Firefighters (N=136)		p- value
	yes	no	yes	no	
1. medications for sleeping	12.7%	87.3%	0.0%	100.0%	0.000
2. sedatives	5.6%	94.4%	0.0%	100.0%	0.005
3. smoking	4.2%	95.8%	2.9%	97.1%	0.566
4. alcohol	4.9%	95.1%	1.5%	98.5%	0.104
5. hobby	69.0%	31.0%	72.0%	28.0%	0.519
6. relaxation	77.5%	22.5%	54.4%	45.6%	0.000
7. consultation with doctor, or psychologist	2.1%	97.9%	0.7%	99.3%	0.336
8. special techniques	1.4%	98.6%	0.0%	100.0%	0.166
9. own techniques	32.4%	67.6%	0.0%	100.0%	0.280

Tab 30 Coping with stressful situations in teachers (according to gender, expressed in %)

	Women teachers (N=102)		Men teachers (N=40)		p- value
	yes	no	yes	no	
1. medications for sleeping	11.8%	88.2%	15.0%	85.0%	0.603
2. sedatives	5.9%	94.1%	5.0%	95.0%	0.838
3. smoking	2.0%	98.0%	10.0%	90.0%	0.033
4. alcohol	2.9%	97.1%	10.0%	90.0%	0.082
5. hobby	62.7%	37.3%	85.0%	15.0%	0.010
6. relaxation	79.4%	20.6%	72.5%	27.5%	0.377
7. consultation with doctor, or psychologist	2.9%	97.1%	0.0%	100.0%	0.275
8. special techniques	2.0%	98.0%	0.0%	100.0%	0.374
9. own techniques	34.3%	65.7%	27.5%	72.5%	0.437

6.7 Evaluation of particular domains of life quality

The last part was the questionnaire survey for evaluating of life quality in both professional groups.

At first, the results for pedagogical workers are presented. In all domains, they reached results similar to the measured population norm (Table 31). The statistical significance was shown in item Q2 “*Satisfaction with own health*”, where the teachers reached worse result than the population norm ($p=0.020$).

Tab 31 Statistical comparison of scores of particular domains of WHOQOL-BREF with population norms (in teachers)

		Average	St.D.	IS-D	IS-H	p-value
Domain 1	norm	15.55	2.55	15.26	15.84	0.330
Physical health	teachers	15.34	1.90	15.02	15.65	
Domain 2	norm	14.78	2.43	14.51	15.05	0.800
Mental health	teachers	14.84	2.23	14.47	15.21	
Domain 3	norm	14.98	2.89	14.66	15.30	0.670
Social relations	teachers	14.86	2.60	14.43	15.29	
Domain 4	norm	13.30	2.08	13.07	13.53	0.340
Environment	teachers	13.10	2.01	12.77	13.43	
Q1	norm	3.82	0.72	3.74	3.90	0.110
Satisfaction with quality of life	teachers	3.70	0.75	3.58	3.82	
Q2	norm	3.68	0.85	3.58	3.77	0.020
Satisfaction with own health	teachers	3.49	0.74	3.37	3.61	

Firefighters reached completely different results. Statistically significant better values were observed ($p<0.001$) in all domains to population norms (Table 32).

Tab 32 Statistical comparisons of scores of particular domains of WHOQOL-BREF with population norms (in firefighters)

		average	St.D.	IS-D	IS-H	p-value
Domain 1	norm	15.55	2.55	15.26	15.84	< 0.001
Physical health	firefighters	17.26	1.73	16.96	17.55	
Domain 2	norm	14.78	2.43	14.51	15.05	< 0.001
Mental health	firefighters	17.04	2.07	16.69	17.39	
Domain 3	norm	14.98	2.89	14.66	15.30	< 0.001
Social relations	firefighters	16.70	2.42	16.29	17.11	
Domain 4	norm	13.30	2.08	13.07	13.53	< 0.001
Environment	firefighters	14.67	2.26	14.28	15.05	
Q1	norm	3.82	0.72	3.74	3.90	< 0.001
Satisfaction with quality of life	firefighters	4.21	0,64	4.10	4.32	
Q2	norm	3.68	0.85	3.58	3.77	< 0.001
Satisfaction with one's own health	firefighters	4.15	0.60	4.05	4.25	

From reciprocal comparison of all domains of life quality, hypothetical differences in both professional groups were shown. In teaching staff, statistically significant worse results were reached - $p < 0.001$ (Tab 33).

Tab 33 Statistical comparisons of scores of each domains of WHOQOL-BREF with population norms between both professional groups

		average	St.D.	IS-D	IS-H	p-value
Domain 1 Physical health	firefighters	17.12	1.86	16.82	17.43	< 0.001
	teachers	15.34	1.90	15.02	15.65	
Domain 2 Mental health	firefighters	16.96	2.07	16.62	17.30	< 0.001
	teachers	14.84	2.23	14.47	15.20	
Domain 3 Social relations	firefighters	16.68	2.41	16.28	17.08	< 0.001
	teachers	14.86	2.60	14.43	15.30	
Domain 4 Environment	firefighters	14.63	2.23	14.26	14.99	< 0.001
	teachers	13.10	2.01	12.76	13.43	
Q1 Satisfaction with quality of life	firefighters	4.21	0.64	4.10	4.31	< 0.001
	teachers	3.70	0.75	3.57	3.82	
Q2 Satisfaction with one's own health	firefighters	4.10	0.63	3.99	4.21	< 0.001
	teachers	3.49	0.74	3.37	3.62	

6.7.1 Influence of particular factors (profession, gender, age groups, occupational stress perception) on domains and items of WHOQOL-BREFF questionnaire

Our tested groups had slight gender and age discrepancies. From this reason, there was a necessity to assess their influence (together with the profession).

In Table 34, the domain about respondents' *physical health* is described. In general, physical health of both professional groups was more or less "good" or "very good". Firefighters (of both age groups) significantly exceed the population norms (p= 0.001). Teachers complained more about "pain and discomfort", "worse ability to move around" and "greater dependency on medical care". Firefighters indicated more "energy" (31% to 7% in teachers), "perfect ability to make daily activities", bigger "satisfaction with quality of sleep and work performance".

Tab 34 Domain 1- Physical health

	average	p-value
Population norm	15.55	
Teachers- whole set	15.34	0.330
Firefighters- whole set	17.26	0.001
Men - whole set	16.89	0.001
Men - teachers	15.67	0.780
Men - firefighters	17.26	0.001
Women - whole set	15.21	0.195
Women - teachers	15.20	0.207
Younger (< 40 years)- whole set	16.83	0.001
Younger -teachers	15.91	0.281
Younger -firefighters	17.51	0.001
Older (≥ 40 years)- whole set	15.60	1.00
Older - teachers	14.85	0.007
Older -firefighters	16.80	0.001
Teachers- negative perception of stress	15.30	0.015
Firefighters- negative perception of stress	16.84	0.003

In the domain concerning “*mental health*” (Tab 35), firefighters had better results to teachers again ($p=0.001$). Men teachers considerably lagged behind the men firefighters - there was less score compared to population norm ($p=0.001$). From the perspective of age groups, the reached result was very similar to the result in the domain of “physical health”. Younger respondents assessed their mental health better than older ($p=0.001$).

Firefighters had greater “*enjoyment of life*” (48% to 18% in teachers); bigger conviction about “*meaning of their life*”, better “*ability to concentrate*” (32% versus 8% in teachers) and better “*acceptance of own physical appearance*” as well. Teachers experienced more “*negative feelings*” such as depression, nervousness, and annoyance.

Domain 3 concerning “*Social relations*” (Tab 36) showed again statistically significant difference between the studied professional groups. Firefighters had higher values than population norms ($p=0.001$), teachers remained at similar values as of the population norm. Women teachers reached lower results in the comparison with men teachers but without statistically significant differences. Between men teachers and men firefighters, there was significant difference ($p=0.001$). Within the age groups, difference was shown only between the younger and the older firefighters ($p=0.010$). In addition, firefighters assessed better their “*satisfaction with personal relationships*” (30% versus 10% in teachers), “*satisfaction with sexual life*” (39% to 14% in teachers), and bigger “*satisfaction with support of friends*”.

Tab 35 Domain 2- Mental health

	Average	p-value
Population norm	14.78	
Teachers- whole set	14.84	0.80
Firefighters- whole set	17.00	0.001
Men- whole set	16.64	0.001
Men teachers	15.30	0.21
Men firefighters	17.00	0.001
Women - whole set	14.76	0.93
Women - teachers	14.65	0.60
Younger (< 40 years)- whole set	16.40	0.001
Younger -teachers	15.23	0.17
Younger -firefighters	17.27	0.001
Older (≥ 40 years)- whole set	15.31	0.027
Older - teachers	14.00	0.36
Older -firefighters	16.62	0.001
Teachers- negative perception of stress	14.50	0.31
Firefighters- negative perception of stress	16.32	0.001

Tab 36 Domain 3- Social relations

	Average	p-value
Population norm	14.98	
Teachers- whole set	14.86	0.67
Firefighters- whole set	16.70	0.001
Men - whole set	16.30	0.001
Men- teachers	14.93	0.92
Men - firefighters	16.70	0.001
Women - whole set	14.98	1.00
Women - teachers	14.84	0.62
Younger (< 40 years)- whole set	16.34	0.001
Younger -teachers	15.53	0.15
Younger -firefighters	16.95	0.001
Older (≥ 40 years)- whole set	15.50	0.82
Older - teachers	14.30	0.061
Older -firefighters	16.25	0.001
Teachers- negative perception of stress	14.68	0.36
Firefighters- negative perception of stress	15.89	0.097

The statistical significance was also registered in most items within the domain 4 “*Environment*” (Tab 37). Naturally, population norm was exceeded in firefighters (p=0.001). Men teachers and younger respondents had a better evaluation than women teachers and older respondents (p=0.001). Monitored groups demonstrated significant differences in “*financial situation*” (9% of firefighters and 3% of teachers were completely satisfied; 5% of firefighters and 15% of teachers were completely dissatisfied).

The items “*Opportunity of leisure time*”, “*satisfaction with physical environment*”, “*living conditions*” and “*transport possibilities*” were assessed more positive by firefighters. Firefighters classified their “*quality of life*” statistically much better than teachers did ($p=0.001$; 31% of them answered “*very good*”, 60% “*good*”). Compared to the firefighters, teachers evaluated their quality of life worse (only 11% of them answered “*very good*”, 53% “*good*”). The statistical significance was registered between men teachers and firefighters ($p=0.001$) as well as among younger and older respondents (Tab 38).

Tab 37 Domain 4- Environment

	average	p-value
Population norm	13.30	
Teachers- whole set	13.10	0.34
Firefighters- whole set	14.67	0.001
Men- whole set	14.30	0.001
Men teachers	13.80	0.53
Men firefighters	14.67	0.001
Women whole set	13.20	0.66
Women teachers	13.11	0.42
Younger (< 40 years)- whole set	14.33	0.001
Younger -teachers	13.71	0.15
Younger -firefighters	14.77	0.001
Older (≥ 40 years)- whole set	13.31	0.96
Older - teachers	12.58	0.006
Older -firefighters	14.48	0.001
Teachers- negative perception of stress	12.93	0.12
Firefighters- negative perception of stress	14.42	0.001

Tab 38 Item Q1- Satisfaction with quality of life

	average	p-value
Population norm	3.82	
Teachers- whole set	3.70	0.11
Firefighters- whole set	4.21	0.001
Men- whole set	4.10	0.001
Men- teachers	3.75	0.57
Men- firefighters	4.21	0.001
Women- whole set	3.72	0.22
Women- teachers	3.68	0.47
Younger (< 40 years)- whole set	4.10	0.001
Younger -teachers	3.88	0.54
Younger -firefighters	4.24	0.001
Older (≥ 40 years)- whole set	3.78	0.61
Older - teachers	3.55	0.004
Older -firefighters	4.15	0.003
Teachers- negative perception of stress	3.69	0.12
Firefighters- negative perception of stress	3.97	0.13

The last domain (Tab 39) concerning respondents' "*satisfaction with health*", teachers were less satisfied with their health (11% were dissatisfied, only 3% were completely satisfied) than firefighters (61% were satisfied and 25% completely satisfied).

Tab 39 Item Q2- Satisfaction with one's own health

	average	p-value
Population norm	3.68	
Teachers- whole set	3.49	0.02
Firefighters- whole set	4.10	0.001
Men- whole set	3.99	0.001
Men- teachers	3.45	0.1
Men- firefighters	4.15	0.001
Women- whole set	3.51	0.062
Women- teachers	3.51	0.072
Younger (< 40 years)- whole set	3.99	0.001
Younger -teachers	3.69	0.92
Younger -firefighters	4.22	0.001
Older (≥ 40 years)- whole set	3.58	0.28
Older - teachers	3.32	0.007
Older -firefighters	4.2	0.001
Teachers- negative perception of stress	3.41	0.005
Firefighters- negative perception of stress	4.00	0.006

In the last Table 40, the comparison of scores of each item was shown between both professional groups. These results were used for the overview of tables mentioned before. As it can be seen, statistically significant differences were in each domain, except the item "*satisfaction with physical environment*" in the domain 4 Environment.

Tab 40 Statistical comparisons of scores of particular items of WHOQOL-BREF with population norms between both professional groups

Domains	Items	p- value	
Domain 1 Physical health	Q3	Pain and discomfort	0.001
	Q4	Dependency on medical care	0.001
	Q10	Energy and fatigue	0.001
	Q15	Ability to move around	0.001
	Q16	Satisfaction with sleep	0.003
	Q17	Daily living activities	0.001
	Q18	Satisfaction with work performance	0.001
Domain 2 Mental health	Q5	Enjoyment of life	0.001
	Q6	Meaning of life	0.001
	Q7	Ability to concentrate	0.001
	Q11	Acceptance of physical appearance	0.001
	Q19	Satisfaction with own identity	0.001
	Q26	Negative feelings	0.001
Domain 3 Social relations	Q20	Satisfaction with personal relationships	0.001
	Q21	Satisfaction with sexual life	0.001
	Q22	Satisfaction with support of friends	0.001
	Q8	Feeling of security in daily life	0.001
Domain 4 Environment	Q9	Satisfaction with physical environment	0.056
	Q12	Financial situation	0.001
	Q13	Access to information	0.060
	Q14	Opportunity of leisure time	0.001
	Q23	Living conditions	0.001
	Q24	Access to health services	0.001
	Q25	Transport possibilities	0.006
Particular items	Q1	Quality of life	0.001
	Q2	Satisfaction with own health	0.001

7 Discussion

Occupational mental stress is one of the most discussed topics among all involved individuals in working environment. According to European surveys, nearly one in three people living in Europe is affected by work-related stress (*Diamantopoulou, 2002*). This dissertation thesis is interested in the assessment of occupational stress and in quality of life among teachers at the 2nd level of elementary schools. In accordance with the studies performed by many researchers (our department included), this profession is classified as a category with “*increased occupational psychic load perception*”.

The first part of the work is devoted to the assessment of self-perception of occupational psychic overload. The Meister’s Questionnaire was used as a legislative tool for evaluating this risk factor. We can conclude that the studied group of teachers exceeded critical values of medians, especially in the items: “*time pressure, burdening responsibility, exhaustion, fatigue and decreasing of long work performance*”. Women teachers and respondents older than 40 years had worse balance in negative subjective perception of responsibility and of decreasing efficiency. In men teachers, we recorded higher prevalence of nervousness.

Final classification of professional psychic load among teachers reached grade two, which means it is temporary influencing their subjective status. The study of *Žídková et al. (2003)* concerning elementary schools teachers’ psychic load showed the results very similar to the findings of ours. In comparison with other professions provided by *Hodačová et al. (2007)* 123 elementary and secondary school teachers were complaining mainly about fatigue and feeling that it was impossible to do this profession for a long time. Furthermore, the women teachers had worse results when compared with the men teachers in the items of overload and the non-specific stress reaction. In the study dealing with the exposure to the health risk factors and their perception by teachers, an increase occupational stress was the second most negatively perceived risk factor affecting their subsequent health (*Šmejkalová, 2011*). *Kohoutek and Řehulka (2011)*, assessing in their study the main stressors of teachers at primary and secondary schools, observed very close results to ours - especially high time pressure, big responsibility, physical symptoms of fatigue, decrease of work performance, long-lasting neurotic and health discomfort, troubles connected with burnout (10%). According to the study aiming self-reported occupational stress in British primary school head teachers, the results reported higher level of the overload and work/ life imbalance that interfere with home life (*Phillips et al. 2007*).

In firefighters, the results of occupational stress assessment were more optimistic than in teachers. This phenomenon could be explained by very strict selection of individuals for work performance after check-up by deep screening of health status, including very detailed evaluation of their mental health. These requirements for working ability are in detail defined by the Regulation No. 487/ 2004 of the Low Digest, which describes the personal capabilities for providing these services.

The integral part of professional stress monitoring was expressing respondents' satisfaction with chosen professions. We considered it very useful to find out, which negative factors of work environment are the most frequent because of better understanding of this topic. The most of our teacher respondents were satisfied with their status of a worker in the educational sector (*Fotinos- Ventouratos et al. 2005*). *Paulik (1998)* stated that the biggest problem is mainly the low social prestige of this profession at recent times, no adequate salary, high administrative burden, and absence of equipment of a good quality. Quantitatively, 40.4% of the surveyed teachers reported that they probably or certainly would leave the teaching profession for another occupation if the opportunity arose. He also highlighted the importance of taking into account all risk factors in both gender.

Řehulka and Řehulková (2001) in their work discovered causes of main problems according to gender. They think that women teachers see the problems in communication with pupils and parents, and in the mastering of the classroom. In men teachers, there are more problems with bigger career growth than with educational activity. In Canada, *Ma and MacMillan (1999)* surveyed over 2,000 elementary school teachers. The study found that women teachers were more satisfied with their professional role as a teacher compared to their men counterparts. But it is postulated that the difference might be related to a greater willingness of the women to declare stress or the increased pressures of work than their men colleagues - life balance in women who may still have the major role in childcare and domestic arrangements alongside their work or both (*Phillips et al. 2007*).

In comprehensive study of *Paulik (1999)* about the psychological aspects of teachers' job satisfaction, average rating of satisfaction was closed to "fairly satisfied". Also among Irish primary school teachers (59% were "very satisfied" and only 2% were not satisfied) this type of result was recorded. Similar result was found in our respondents (82.4%). The distribution of answer "yes" was similar in both genders, but men teachers were more often undecided than women teachers. This indecision or starting dissatisfaction could be related to increased age and years of practise (they are considered to have bigger power).

Level of importance is another aspect, which is strongly connected with longer work performance. Older and more experienced teachers are attached to this aspect obviously.

The average of overall assessment of satisfaction with some other sides of teacher profession (satisfaction with pupils, colleagues, school management and equipment of school) wasn't different between men and women teachers.

This statement was also close to our results. As for the work satisfaction, the question concerning the probability of choosing the teaching profession again was interesting. They claimed that this profession would not be probably chosen. In our case, we came to the similar results. Motivation to perform this job is not very positive and less than 60% of our teachers are not able to handle obligatory duties connected with their profession. The lowest satisfaction was indicated with salary in the education system again.

In the paper of *Bishay (1996)* we found the following ideas: “*Teacher motivation is based on the freedom to try new ideas, achievement of appropriate responsibility levels and intrinsic work elements...*” or: “*True job satisfaction is derived from the gratification of- higher - order needs, social relations, esteem and actualization rather than lower order needs*”.

The big study performed by The Teaching Council in Ireland (*Darmody and Smyth et al. 2010*) provides newer information. Higher prevalence of perceived teacher stress has got an increased tendency with age of pupils and with worse cooperation with parents. Approximately 50% of our pedagogical workers are not able to work with them. The main described problem is usually early start of pubertal stage. *Kyriacou (2001)* stated that teaching pupils who lack motivation is one of the main sources of stress. Studies also show that improvement in teacher motivation brings benefits for students as well as for teacher. The relationship between teacher's motivation and students' achievement has not been established. However, the correlation between teacher's performance and students' self-esteem has been strong. Students seem to recognize the effectiveness of teachers who are satisfied with their teaching performance and how teachers feel about work *Bishay (1996)*. Day-to-day interaction among the school partners – teachers, pupils, parents – matters in shaping teachers' own experiences. Teachers will become more satisfied when parents become more involved in school life.

As in many scientific papers concerning the relationships with the colleagues and teaching staff has been stated satisfactory. Also our results come with the same conclusions. In connection with this statement, the validity of such conclusion has to be taken into account.

Although satisfactions seem to be more associated with personal factors, the influence of environmental factors cannot be ruled out.

In the second part of our scientific work we tried to objectivise the level of subjectively perceived stress by the assessment of physiological response of organism to stress by monitoring the salivary cortisol level. According to our research, cortisol concentrations in teachers and firefighters reached morning and evening values within normal range. But individual differences between these two professions were quite large. Among teachers, the morning saliva cortisol levels were on similar line between both genders. Overall, men teachers showed higher levels and also had higher levels during the whole working day than women teachers. It indicated flattening on their diurnal cortisol slope and smaller relative slope. These our findings corresponded with the results of *Steptoe et al. (2000)*. His observations of total daytime output of cortisol tended to be higher in men teachers when compared with women teachers. From physiological side, slightly increased levels might reflect then heightened responsiveness of hypothalamus-pituitary axis to acute challenge. It is possible that men teachers master confrontations with some situations by a different way than women teachers. This fact was observed by *Kirschbaum et al. (1999)* where they suggested elevated adrenocorticotrophic hormone together with a stronger response to more stressful stimuli compared to females. According to salivary cortisol levels, men teachers seemed to be more affected by stress than men firefighters. Some inconsistencies of not point to high occupational stress at a group level could be explained by very low concentrations of salivary cortisol, while the individual variations may show higher values (*Moya-Albiol, 2010*).

Simple morning value of cortisol is described as a good predictor of unbalance or pathologies (*Grossi et al. 2005*). In the presented study, teachers had morning concentrations of cortisol $c= 7.69$ nmol/l.

In comparison with other studies, the measured concentrations are different. For instance, *Masilamani et al. (2012)* reported concentration $c=2.24$ nmol/l in Malaysian women teachers towards the men teachers' concentration which was estimated around 2.64 nmol/l. In contrast, in the study of *Moya-Albiol (2010)*, the morning cortisol values in teachers were scored to high level of burnout ($c=18.92$ nmol/l) compared to teachers with lower state of burnout ($c=3.25$ nmol/l). The study of *Pruessner et al. (1999)* observed very similar results reported in the previous study. Teachers suffering form burnout had elevated cortisol concentrations ($c=15.3$ nmol/l).

The study performed by *Brandstädter et al. (1999)* was focused on socioeconomic status in teaching profession. They proved that low early morning cortisol levels and less marked slope to the daytime rhythm can be associated with lower socioeconomic status and worse well-being. Generally, the teaching profession is an occupation with potentially lower socioeconomic status these days. On this basis, we can assume probability of low level of burnout in our respondents.

The significantly higher evening cortisol level was found in men teachers and in their age subgroups. This indication can mean that aging might be potential confounding factor of increased salivary cortisol levels. This argument was supported by study of *Ferrari et al. (2001)*. Another statement is built on assertion that these impaired levels could mark a reduced activity of central cholinergic and serotonergic pathways. *Cohen et al. (2006)* reported potential associations between lower socioeconomic status and potentially higher evening salivary cortisol. Firefighting belongs to occupations with many variability and character of the work performance is unpredictable (*Kales et al. 2005*). In our study, the respondents had lower daytime cortisol, which is a sign of a good health. The study of *Perroni et al. (2009)* concluded that the firefighters' daily work stressors were of different intensity and we could consider an adaption to stress to play the role.

For better comparison with other occupations by using salivary cortisol levels method, we found similar results in the study of *Yang, et al. (2001)*. Two groups of nurses were taken into account (emergency department nurses vs. general ward nurses). They found that emergency department (ED) nurses showed higher levels of salivary cortisol than general ward (GW) nurses. The morning salivary cortisol concentration in ED nurses was attenuated ($c= 9.10$ nmol) when compared to GW nurses ($c=15.45$ nmol/l). We can observe results very close to our achieved values.

Another important marker is the shape of the final diurnal curve. Many authors prove big difference between single morning and single evening values. Typically, normal diurnal curve is associated with large decrease, and in contrast, a weakened (or flattened) curve is an indicator of lower morning values or high evening values or both.

Adam and Kumari (2009) in their study state that “steeper decline of the diurnal slope expresses better health” (psychosocial and physical together). In our case, men teachers showed impaired diurnal slope when compared to women teachers. This conclusion can point out worse physical and psychological health in subgroup of men teachers.

Flatter decline has also been shown in lower socioeconomic status groups relative to higher socioeconomic status groups. It has been suggested that chronic stress may explain this state in these individuals (*Steptoe et al. 2003*).

In firefighters, the diurnal curve seemed to be more attenuate. In the study of *Kudielka (2006)*, this phenomenon could be explained by a biological view such as adaption to stress together with reduction of cortisol response. The values usually return to normal range through a homeostasis process.

A substantial part of this evaluation is the description of hormonal output by *Pruessner et al. (2003)*. As mentioned before, greater value of area under the curve is sign of worse health status. Based on the achieved results, women teachers had smaller hormonal output and higher reactivity of daily stressors. On the opposite side, men teachers had greater hormonal output and smaller reactivity to daily stressors.

When we take into account possible confounders of salivary cortisol (smoking status and level of physical activity), we recorded statistical significant differences only in firefighters. Morning cortisol values and overall hormonal output were significantly higher. Because of inconsistent results from the studies, we can presume some reasons which be able to responsible for lower cortisol values. The first reason can be that larger value of morning cortisol has been reported with range of adverse psychosocial factors such as high work demands (*Kunz Ebrecht et al 2004*). These demands are eventually connected with work at night (night- shift work) where sleep disturbances can play a main role. The last issue is taking to possibility smoking cessation or occasionally smoking in our respondents. Findings suggest that the reduction in cortisol is probably an „offset effect“, related to a fall in levels of nicotine or other constituents of tobacco smoke.

The explanation for this variation is not yet clear. There may be a dimension of experience underlying these diverse phenomena that accounts for whether the CAR is heightened or reduced in a particular risk group (*Steptoe et al. 2006*).

We were wondering, how performed profession may influence to overall quality of life and whether these our studied groups have differed in quality of life. From the overall perspective, pedagogical workers definitely had significantly lower results in all domains than firefighters. The domain concerning “satisfaction with their health” was comparable to results mentioned before. We might explain this fact from many different views.

One of them is strictly selected group of people, who want to work in the Fire and Rescue System. Simply, firefighters are selected respondents, who have to be checked up physically, emotionally and mentally. In teachers, check-up of their health status for a work performance is required.

However, there are few studies on the psychosocial aspects of work, with respect to elementary school teachers. In a cross-sectional study carried out with 1319 workers, aged between 18 and 64 years, negative associations were reported between the psychosocial aspects of work and quality of life. The results showed a significant statistical association between the high work demand variable (it means high demand and low control) and low scores in the following quality of life domains.

In the study of *Fernandes and Maria de Rocha (2009)* about quality of life in Brazilian elementary school teachers, they found the physical and environment domains were the most affected. Specifically with regard to the affected physical domain in individuals characterized as having psychologically demanding work. The assessment of this psychosocial aspect included the questions about the time required to perform activities, excessive amount of work and presence of conflicting demands. These factors may contribute to the emergence of physical pathologies that lead to chronic pain and the need for medication. These disorders could indirectly influence the performance of the daily activities, the capacity to work and mobility. Also, health - sickness process experienced by workers might affect quality of life. In teachers it can lead to higher absenteeism, may induce greater indifference in the accomplishment and innovation of educational practises.

With regard to the affected psychosocial domain, positive associations are generally observed between highly demanding work and the greater occurrence of mental health disorders. The work-related stress suffered by teachers may have contributed to the lower scores in this domain. These aspects could interfere self-esteem, memory and concentration, contributing to the emergence of negative feelings. *Kebza (2005)* presents in his work that the most important determinants of quality of life are social contacts, social support, coherence of group and contribution. On the basis of achieved results, teachers did not show any statistically significant difference within measured population norm. On contrary, firefighters rated this domain highly above the population norm (mainly in questions about satisfaction with personal relationships, sexual life and support of their friends).

High rating was achieved in mental health domain in questions “life evaluation, self-confidence and self-esteem, too. According to *Blatný (2001)*, self-esteem is feature, which might be classified such as prerequisite of life satisfaction. Those with demanding and active work are more affected in the environment domain, highlighted by the problem of low salaries. The lower social status hinders these workers from the access to health services, to leisure time options and to asset acquisition. A school infrastructure characterized by lack of ventilation, elevated noise levels; chalk dust and low illumination can contribute to negative results of this domain assessment. Higher perception of stress may be one of another factor, which could decrease quality of life. Recent studies have given positive information about self-perceived stress at work in teachers. For an example, *Paulík (2012)* obtains relative satisfaction among these workers, in spite of higher level of work-related stress. The probable explanation could be enshrined in personality, hardiness, optimistic mood, temperament etc. In the study of *Nepožitková (2009)*, the relations between quality of life and professional occupational stress were investigated. It showed better assessment of quality of life in people with lower level of work-related stress. Thus, we can conclude that professional psychic overload can be one of the factors for decreasing quality of life, especially in teachers.

Age and gender have been described as important indicators of quality of life in teachers. From our results, these variables are the main confounders. In one study of *Yang et al. (2009)* about relationship between quality of life and occupational stress among Chinese teachers, gender was found to be the most crucial factor for physical health.

It is believed that results of these investigations can help direct public policies aimed at promoting the health of this group of workers.

Limitations

This study has some limitations. The single measurements of salivary cortisol were taken in one working day only, which can mean limited examination and depiction of real work-related stress. In the future, this collection should be enriched by one resting day in more professional groups. We selected a cross-sectional epidemiological study design, which cannot catch real causality relations and associations. One possible reason is the use of self-reported measures (questionnaires), answers to which can be influenced by subjectivity of respondents in each item and domains. Also, we didn't study deeply all psychological characteristics, even though some questions were included into the questionnaire. All recommendations are supported by need to perform big longitudinal study for investigations and understanding individual relations.

8 Conclusions

Within the described limitations of study, conclusions were drawn:

- teachers showed higher perception of mental load (proved by the Meister Questionnaire);
- the average salivary cortisol concentration were higher in teachers and it outlines higher exposition to chronic stress (even if measured concentrations are in range of normal values);
- we proved growing tendency to flattened diurnal slope in teachers;
- we found higher probability of fatigue and decreasing quality of long work performance in teachers;
- by our results, we proved that assessment of occupational stress by questionnaire inquiry had the comparable validity to biochemical analysis of salivary cortisol. This finding is very useful for hygienic practise as the questionnaire inquiry is much cheaper than the immunoassay analysis;
- greater indecision in teachers (domination of answers “undecided”) was found;
- in all four domains of quality of life, we proved statistically lower values in teachers than in firefighters (but not statistically significant difference with Czech population norms);
- we assessed that negatively perceived occupational stress of teachers can decrease their quality of life (especially in the assessment of their own health);
- nevertheless we consider that a type of profession doesn't have a major impact on overall quality of life. Age and gender seem to be stronger determinants of QoL.

Due to the conclusions, we recommend for considering:

- regular monitoring of occupational stress;
- working only with subjective feelings of workers;
- taking into account a possibility of influencing of work performance by non-work factors;
- inclusion of salivary cortisol use to public health practise as a possible objective marker indicated mental overload;

- improvement of the existing methodology for purposes of future health risk assessment;
- developing of the standard salivary curve of Czech population for better interpretation of reached results.

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Nařízení vlády č. 361/2007 Sb. kterým se stanoví podmínky ochrany zdraví při práci. *Government Regulation no. 361/ 2007 about requirements of public health protection at work*. [in Czech]. Recently amendment in: 9/13. [in Czech]

Vyhláška Ministerstva zdravotnictví č.432/2003 Sb. kterou se stanoví podmínky pro zařazování prací do kategorií, limitní hodnoty ukazatelů biologických expozičních testů, podmínky odběru biologického materiálu pro provádění biologických expozičních testů a náležitosti hlášení prací s azbestem a biologickými činiteli. *Ministry of Health Decree no. 432/2003 about requirements for work categorization, limit values of biological exposure tests, conditions of biological material sampling for biological exposure tests and the notification of work with asbestos and biological agents*. Recently amendment in: 2013. [in Czech]

Appendices

Appendix A- questionnaire for teachers

Appendix B- questionnaire for firefighters

Appendix A- questionnaire for teachers

Vážená pani, vážený pán

dovoľujem si Vás požiadať o vyplnenie dotazníka, ktorá má za cieľ zistiť spokojnosť s výberom zamestnania, ktoré v súčasnej dobe vykonávate. Dotazník prosím vyplňujte samostatne, v prípade neporozumenia niektorej otázky je možné poskytnúť osobný rozhovor. Každú otázku vyhodnoťte na základe svojej súčasnej situácie. Hodnotenie nájdete pri každej otázke. Dotazník je anonymný a údaje budú použité len na účel vypracovania dizertačnej práce.

Za spoluprácu vopred ďakujem.

Mgr. Oľga Šušoliaková
Ústav hygieny a preventívneho lékařství
Lékařská fakulta UK v Hradci Králové
Univerzita Karlova v Praze

Vaše osobné údaje:

Pohlavie: žena muž

Vek: rokov

Bydlisko:

veľké mesto menšie mesto vidiek

Rodinný stav:

vydatá/ženatý vdova/vdovec
 slobodná/ slobodný družka/ druh
 rozvedená/ rozvedený

Počet detí:

0 3 a viac
 1-2

Najvyššie dosiahnuté vzdelanie:

stredoškolské s maturitou pedagogická fakulta iná fakulta VŠ

Počet rokov v pedagogickej praxi (u žien bez materskej): rokov

V súčasnosti vyučujem predmety:

Moja aprobácia:.....

Subjektívne hodnotenie zdravia

Otázky v tejto časti sa zameriavajú na stručnú osobnú anamnézu a hlavne ako hodnotíte svoje celkové zdravie. Vaše odpovede zakrúžkujte na škále od 5-1.

	spokojná/ý	skôr spokojná/ý	neviem posúdiť	skôr nespokojná/ý	nespokojná/ý
1. Ako hodnotíte Vaše telesné zdravie?	5	4	3	2	1

2. Bola Vám diagnostikovaná nejaká chronická choroba? áno* nie

3. *Ak áno, z ktorých tu vymenovaných chorôb sa potiaže prevažne týkajú?

- | | |
|---|---|
| <input type="checkbox"/> kardiovaskulárne ochorenie | <input type="checkbox"/> nádorové ochorenie |
| <input type="checkbox"/> diabetes mellitus | <input type="checkbox"/> ochorenie pohybového systému |
| <input type="checkbox"/> psychické ochorenie | <input type="checkbox"/> ochorenie dýchacieho systému |
| <input type="checkbox"/> alergie | <input type="checkbox"/> ochorenie tráviaceho systému |
| <input type="checkbox"/> neviem odpovedať | <input type="checkbox"/> nebudem odpovedať |

*Ak ste uviedli „alergie“, prosím vypíšte názov lieku, ktorý užívate:

!Pre ženy

V prípade užívania antikoncepcie alebo inej hormonálnej liečby, prosím uveďte názov lieku:

Hodnotenie profesie, pracovného prostredia a medziľudských vzťahov

Otázky v tejto časti dotazníka sa týkajú predovšetkým hodnotenia Vášho zamestnania, pracovného prostredia a vzťahov na pracovisku. Jedná sa o veľmi dôležitú časť, venujte jej náležitú pozornosť. Vaše odpovede zakrúžkujte na škále od 5-1.

Ak sa pomýlite, alebo chcete zmeniť svoju odpoveď, škrtnete čo neplatí a zakrúžkujete to, čo platí.

A. sekcia: Hodnotenie profesie a pracoviska

	spokojná/ý	skôr spokojná/ý	t'azko sa rozhodnúť	skôr nespokojná/ý	nespokojná/ ý
1. Ste spokojná/ý s profesiou, ktorú vykonávate?	5	4	3	2	1
2. Ste spokojná/ý s prestížou školy, kde pracujete?	5	4	3	2	1
3. Ste spokojná/ý s prostredím školy, s jej vybavením?	5	4	3	2	1
4. Ako hodnotíte Vaše svoj vzťah k vedeniu školy, kde pracujete k Vám osobne?	5	4	3	2	1
5. Ako hodnotíte svoj vzťah k spolupracovníkom k Vám osobne?	5	4	3	2	1
6. Ako hodnotíte vzťahy v učiteľskom zbore?	5	4	3	2	1
7. Ako hodnotíte spoluprácu so žiakmi?	5	4	3	2	1
8. Ako hodnotíte aktivitu žiakov pri vyučovaní?	5	4	3	2	1
9. Ako hodnotíte spoluprácu rodičov s Vami?	5	4	3	2	1
10. Ako hodnotíte svoje zvládanie nárokov vašej profesie?	5	4	3	2	1

Hodnotenie pracovne- psychickej záťaže (Meisterov dotazník)

Vašou úlohou je u každej otázky zakrúžkovať odpoveď, ktorá najviac vystihuje Vaše pocity pri práci.

5 - áno, plne súhlasím; 4 - skôr áno; 3 - neviem, niekedy áno, niekedy nie;
2 - skôr nesúhlasím; 1 - nie, vôbec nesúhlasím;

- | | | | | | |
|--|---|---|---|---|---|
| 1. Pri práci mávam často pocit časového tlaku | 5 | 4 | 3 | 2 | 1 |
| 2. Práca ma neuspokojuje, chodím do nej nerád | 5 | 4 | 3 | 2 | 1 |
| 3. Práca ma veľmi psychický zaťažuje pre vysokú zodpovednosť, spojenú so závažnými dôsledkami | 5 | 4 | 3 | 2 | 1 |
| 4. Práca je málo zaujímavá, duševne skôr otupujúca | 5 | 4 | 3 | 2 | 1 |
| 5. V práci mám časté konflikty a problémy, od nich sa nemôžem odpútať ani po skončení pracovnej doby | 5 | 4 | 3 | 2 | 1 |
| 6. Pri práci udržujem len s námahou pozornosť, pretože sa po dlhú dobu nič nového nedeje | 5 | 4 | 3 | 2 | 1 |
| 7. Práca je tak psychicky náročná, že po niekoľkých hodinách cítim nervozitu a roztrasenosť | 5 | 4 | 3 | 2 | 1 |
| 8. Po niekoľkých hodinách mám práce natoľko dosť, že by som chcel/a robiť niečo iného | 5 | 4 | 3 | 2 | 1 |
| 9. Práca je psychicky tak náročná, že po niekoľkých hodinách cítim únavu a ochablosť | 5 | 4 | 3 | 2 | 1 |
| 10. Práca je psychicky tak náročná, že ju nemožno robiť niekoľko rokov s rovnakým výkonom | 5 | 4 | 3 | 2 | 1 |

B. sekcia: Hodnotenie Vašej osoby ako pedagogického pracovníka

1. Myslíte si, že spĺňate základné atribúty pre výkon tejto profesie? áno nie

2. Boli ste v poslednom roku pochválení za svoju prácu? áno* nie

*Ak áno, kým (uved'te všetky možnosti): vedenie školy žiak rodič inak

Ak inak, kým:

3. Ste dostatočne motivovaní pre výkon svojej profesie?

- áno, veľmi skôr nie
 skôr áno nie
 priemerne neviem posúdiť

4. Máte okrem svojho zamestnania ako pedagogického pracovníka aj iné zamestnanie?

áno* nie

*Ak áno, uved'te aké:

5. V nasledujúcej tabuľke zhodno'te, ako sám seba ako pedagóga na stupnici od 5-1.

	maximálne	veľa	stredne	trocha	vôbec nie
odbornosť v problematike	5	4	3	2	1
autorita pred žiakmi	5	4	3	2	1
riadiace schopnosti	5	4	3	2	1
zmysel pre spravodlivosť	5	4	3	2	1
komunikatívnosť	5	4	3	2	1
trpezlivosť	5	4	3	2	1
priateľský prístup k žiakom	5	4	3	2	1
dôslednosť	5	4	3	2	1
náročnosť	5	4	3	2	1

C. sekcia: Iné stresové situácie a ich zvládanie

1. Ovplyvňuje Vašu záchranársku činnosť nejaká negatívna životná udalosť? áno* nie

*Ak áno, uveďte aká(, pokiaľ je udalostí viac, uveďte všetky možnosti):

- úmrtie blízkeho človeka
- ochorenie u blízkeho človeka
- finančné problémy
- rodinné problémy
- iné, aké:.....
- odmietam odpovedať

2. Boli ste niekedy v minulosti šikanovaný zo strany zamestnávateľa? áno nie

3. Máte v svojom okolí blízkeho človeka, na ktorého sa môžete spoľahnúť? áno* nie

*Ak áno, uveďte koho(uveďte všetky možnosti):

- manžel, manželka
- kolegovia z práce
- priatelia
- pomáha mi viera
- deti

4. Uveďte, aké možnosti zvládania stresu preferujete? (uveďte všetky možnosti)

- lieky na spanie
- lieky na ukludnenie
- fajčenie
- alkohol
- hobby
- odpočinok(spánok, relaxácia)
- konzultácia s lekárom, event. so psychológom
- odborné techniky zvládania stresu
- vlastné osobné techniky zvládania stresu

6. Do nasledujúcej tabuľky, prosím vypíšte **3** Vami najčastejšie využívané techniky zvládania stresu (na odpoveď sa môžete inšpirovať otázkou č.4)

Poradie	Technika zvládania
1.	
2.	
3.	

Životný štýl

Táto časť dotazníka sa zameriava, aký je Váš celkový životný štýl. Svoju odpoveď pravdivo zaškrknite do príslušného okienka.

1. Raňajujete?

- áno, pravidelne každý deň,
- ako kedy, nepravidelne, a to(zakrúžkujte odpoveď) :
1x 2x 3x 4x 5x 6x/ týždeň
- nie, nikdy

2. Obedujete?

- áno, pravidelne každý deň,
- ako kedy, nepravidelne, a to(zakrúžkujte odpoveď) :
1x 2x 3x 4x 5x 6x/ týždeň
- nie, nikdy

3. Večeriare?

- áno, pravidelne každý deň
- ako kedy, nepravidelne, a to(zakrúžkujte odpoveď) :
1x 2x 3x 4x 5x 6x/ týždeň
- nie, nikdy

4. Kedy si dáte posledné jedlo dňa?

- do 17 hodiny
- 17- 18 hodina
- 19 hodina a neskôr

5. Pokiaľ konzumujete niečo po 19. hodine, čo si väčšinou dáte?

- sladkosť
- ovocie
- celozrnný chlieb, jogurt,...
- hranolčeky, chipsy, zmrzlina,...

6. Aké množstvo tekutín najčastejšie denne vypijete ?(l)

- menej než 1 l
- 1-2 l
- 2-3 l
- viac než 3 l

7. Aké nápoje najčastejšie preferujete?

- čaje, minerálne vody nesladené,
- čaje, minerálne vody sladené,
- limonády, coca-cola apod.
- iné, aké:

8. Vaša pohybová aktivita

- pravidelne každý deň
- ako kedy, nepravidelne, a to(zakrúžkujte odpoveď) :
1x,2x,3x,4x,5x,6x/týždeň
- nie, nikdy

Pokiaľ ste označili jednu z prvých 2 možností, ako dlho trvá 1 cvičenie?

- do 30 minút
- 30- 60 minút
- viac než 60 minút

Uved'te najčastejšie príklady svojej pohybovej aktivity:.....

Pokiaľ ste odpovedali „nie“, nikdy – chodíte aspoň pešo?

- áno*
- nie

*Ak áno, uved'te približný čas: minút

9. Ako často využívate počítač počas týždňa?

- pravidelne každý deň
- ako kedy, nepravidelne , a to(zakrúžkuj odpoveď) :
1x 2x 3x 4x 5x 6x/týždeň
- nie, nikdy

Pokiaľ ste označili jednu z prvých 2 možností, uved'te približný čas?

- do pol hodiny
- 1 - 2 hodiny
- 3 - 5 hodín
- 5 hodín a viac

10. Ako často sledujete televíziu počas týždňa?

- pravidelne každý deň
- ako kedy, nepravidelne , a to(zakrúžkujte odpoveď) :
1x 2x 3x 4x 5x 6x/týždeň
- nie, nikdy

Pokiaľ ste označili jednu z prvých 2 možností, uved'te približný čas?

- do pol hodiny
- 1 - 2 hodiny
- 3 - 5 hodín
- 5 hodín a viac

11. Fajčíte?

- pravidelne každý deň
- ako kedy, nepravidelne , a to(zakrúžkujte odpoveď) :
1x 2x 3x 4x 5x 6x/týždeň
- fajčil/ a som, ale prestal/a som
- nie, nefajčím

Pokiaľ ste odpovedali na jednu z prvých 2 možností, uveďte množstvo:.....ks/deň

Kvalita života podľa Svetovej zdravotníckej organizácie WHOQOL- BREF 26

Tieto otázky zisťujú, ako vnímate svoju kvalitu života, zdravia a ostatných životných oblastí. Berte pritom do úvahy, ako bežne žijete, svoje plány, radosti aj starosti. Pýtame sa na Vaš život za **posledné 2 týždne**. Máme teda na mysli posledné 2 týždne.

Prečítajte si láskavo každú otázku, zhodnoťte svoje pocity a zakrúžkujte u každej otázky to číslo stupnice, ktorá najlepšie vystihuje Vašu odpoveď.

1. Ako by ste hodnotil/a kvalitu svojho života?	veľmi zlá	zlá	ani zlá, ani dobrá	dobrá	veľmi dobrá
	1	2	3	4	5

2. Ako ste spokojný/á so svojim zdravím?	veľmi nespokojný/á	nespokojný/á	ani spokojný/á ani nespokojný/á	spokojný/á	veľmi spokojný/á
	1	2	3	4	5

Nasledujúce otázky zisťujú, ako moc ste prežívali behom posledných 2 týždňov určité veci.

	vôbec nie	trochu	stredne	veľa	maximálne
3. Do akej miery Vám bolesť bráni v tom, čo potrebujete robiť?	1	2	3	4	5
4. Ako moc potrebujete lekársku starostlivosť, aby ste mohli fungovať v každodennom živote?	1	2	3	4	5
5. Ako moc Vás teší život?	1	2	3	4	5
6. Nakoľko sa Vám zdá, že má Vaš život zmysel?	1	2	3	4	5

7. Ako sa dokážete sústrediť?	1	2	3	4	5
8. Ako bezpečne sa cítite vo svojom každodennom živote?	1	2	3	4	5
9. Aké zdravé je prostredie, v ktorom žijete?	1	2	3	4	5

Nasledujúce otázky zisťujú, v akom rozsahu ste robili, alebo mohli robiť určité činnosti v posledných 2 týždňov.

	vôbec nie	trochu	stredne	veľa	maximálne
10. Máte dosť energie pre každodenný život?	1	2	3	4	5
11. Dokážete akceptovať svoj telesný vzhľad	1	2	3	4	5

12. Máte dosť peňazí k uspokojeniu vlastných potrieb?	1	2	3	4	5
13. Máte prístup k informáciám, ktoré potrebujete pre svoj každodenný život?	1	2	3	4	5
14. Máte možnosť venovať sa svojim záľubám?	1	2	3	4	5

15. Ako sa dokážete pohybovať?	veľmi zle	zle	ani zle, ani dobre	dobre	veľmi dobre
	1	2	3	4	5

Ďalšie otázky sa zameriavajú na to, ako ste bol/a šťastný/á, alebo spokojný/á s rôznymi oblasťami svojho života v posledných 2 týždňov.

	veľmi nespokojný/á	nespokojný/á	ani spokojný/á ani nespokojný/á	spokojný/á	veľmi spokojný/á
16. Ako ste spokojný/á so svojim spánkom?	1	2	3	4	5

17. Ste spokojný/á so svojou schopnosťou prevádzať každodenné činnosti?	1	2	3	4	5
18. Ako ste spokojný/ so svojim pracovným výkonom?	1	2	3	4	5
19. Ako ste spokojný/á sám/sama so sebou	1	2	3	4	5
20. Ako ste spokojný/á so svojimi osobnými vzťahmi?	1	2	3	4	5
21. Ako ste spokojný/á so svojim sexuálnym životom?	1	2	3	4	5
22. Ako ste spokojný/á s podporou, ktorú Vám poskytujú priatelia?	1	2	3	4	5
23. Ako ste spokojný/á s podmienkami v mieste, kde žijete?	1	2	3	4	5

24. Ako ste spokojný/á s dostupnosťou zdravotnej starostlivosti?	1	2	3	4	5
25. Ako ste spokojný/á s dopravou?	1	2	3	4	5

Nasledujúca otázka sa týka toho, ako často ste prežívali určité veci behom posledných 2 týždňov.

	nikdy	niekedy	stredne	celkom často	neustále
26. Ako často prežívate negatívne skúsenosti, napr. namrzenosť, beznádej, úzkosť, depresia?	1	2	3	4	5

Ďakujem za vyplnenie dotazníka

Appendix B- questionnaire for firefighters

Vážená pani, vážený pán

dovoľujem si Vás požiadať o vyplnenie dotazníka, ktorá má za cieľ zistiť spokojnosť s výberom zamestnania, ktoré v súčasnej dobe vykonávate. Dotazník prosím vyplňujte samostatne, v prípade neporozumenia niektorej otázky je možné poskytnúť osobný rozhovor. Každú otázku vyhodnoťte na základe svojej súčasnej situácie. Hodnotenie nájdete pri každej otázke. Dotazník je anonymný a údaje budú použité len na účel vypracovania dizertačnej práce.

Za spoluprácu vopred ďakujem.

Mgr. Oľga Šušoliaková
Ústav hygieny a preventívneho lekárství
Lékařská fakulta UK v Hradci Králové
Univerzita Karlova v Praze

Vaše osobné údaje:

Pohlavie: žena muž

Vek: rokov

Bydlisko:

veľké mesto menšie mesto vidiek

Rodinný stav:

vydatá/ženatý vdova/vdovec

slobodná/ slobodný družka/ druh

rozvedená/ rozvedený

Počet detí:

0 3 a viac

1-2

Najvyššie dosiahnuté vzdelanie:

stredoškolské s maturitou VŠ 1. stupňa* VŠ 2. stupňa*

(uved'te nižšie absolvovanú fakultu)

*Fakulta:

Počet rokov v aktívnej praxi: rokov

Vaša postavenie v hasičskom a záchrannom zbore:.....

Subjektívne hodnotenie zdravia

Otázky v tejto časti sa zameriavajú na stručnú osobnú anamnézu a hlavne ako hodnotíte svoje celkové zdravie. Vaše odpovede zakrúžkujte na škále od 5-1.

	spokojná/ý	skôr spokojná/ý	neviem posúdiť	skôr nespokojná/ý	nespokojná/ý
1. Ako hodnotíte Vaše telesné zdravie?	5	4	3	2	1

2. Bola Vám diagnostikovaná nejaká chronická choroba? áno* nie

3. *Ak áno, z ktorých tu vymenovaných chorôb sa potiaže prevažne týkajú?

- | | |
|---|---|
| <input type="checkbox"/> kardiovaskulárne ochorenie | <input type="checkbox"/> nádorové ochorenie |
| <input type="checkbox"/> diabetes mellitus | <input type="checkbox"/> ochorenie pohybového systému |
| <input type="checkbox"/> psychické ochorenie | <input type="checkbox"/> ochorenie dýchacieho systému |
| <input type="checkbox"/> alergie | <input type="checkbox"/> ochorenie tráviaceho systému |
| <input type="checkbox"/> neviem odpovedať | <input type="checkbox"/> nebudem odpovedať |

*Ak ste uviedli „alergie“, prosím vypíšte názov lieku, ktorý užívate:

Hodnotenie profesie, pracovného prostredia a a medziľudských vzťahov

Otázky v tejto časti dotazníka sa týkajú predovšetkým hodnotenia Vašeho zamestnania, pracovného prostredia a vzťahov na pracovisku. Jedná sa o veľmi dôležitú časť, venujte jej náležitú pozornosť. Vaše odpovede zakrúžkujte na škále od 5-1. Ak sa pomýlite, alebo chcete zmeniť svoju odpoveď, škrtnete čo neplatí a zakrúžkujte to, čo platí.

A. sekcia: Hodnotenie profesie a pracoviska

	spokojná/ý	skôr spokojná/ý	neviem posúdiť	skôr nespokojná/ý	nespokojná/ý
1. Ste spokojná/ý s profesiou, ktorú vykonávate?	5	4	3	2	1
2. Ste spokojná/ý s pracoviskom, kde vykonávate svoju funkciu?	5	4	3	2	1
3. Ako hodnotíte Váš vzťah k vedeniu, kde pracujete k Vám osobne?	5	4	3	2	1
4. Ako hodnotíte Váš vzťah k spolupracovníkom k Vám osobne?	5	4	3	2	1
5. Ako celkovo hodnotíte vzťahy vo Vašom zbore?	5	4	3	2	1
6. Ako hodnotíte spoluprácu s inými zložkami záchranného systému?	5	4	3	2	1
7. Ako hodnotíte spoluprácu občanov s Vami?	5	4	3	2	1
8. Ako hodnotíte svoje zvládanie nárokov Vašej profesie?	5	4	3	2	1

Pracujete na smeny ? áno nie

Koľkokrát do mesiaca slúžite nočnú službu?

Hodnotenie pracovne- psychickej záťaže (Meisterov dotazník)

Vašou úlohou je u každej otázky zakrúžkovať odpoveď, ktorá najviac vystihuje Vaše pocity pri práci.

5 - áno, plne súhlasím; 4 - skôr áno; 3 - neviem, niekedy áno, niekedy nie;
2 - skôr nesúhlasím; 1 - nie, vôbec nesúhlasím;

- | | | | | | |
|--|---|---|---|---|---|
| 1. Pri práci mávam často pocit časového tlaku | 5 | 4 | 3 | 2 | 1 |
| 2. Práca ma neuspokojuje, chodím do nej nerád | 5 | 4 | 3 | 2 | 1 |
| 3. Práca ma veľmi psychický zaťažuje pre vysokú zodpovednosť, spojenú so závažnými dôsledkami | 5 | 4 | 3 | 2 | 1 |
| 4. Práca je málo zaujímavá, duševne skôr otupujúca | 5 | 4 | 3 | 2 | 1 |
| 5. V práci mám časté konflikty a problémy, od nich sa nemôžem odpútať ani po skončení pracovnej doby | 5 | 4 | 3 | 2 | 1 |
| 6. Pri práci udržujem len s námahou pozornosť, pretože sa po dlhú dobu nič nového nedeje | 5 | 4 | 3 | 2 | 1 |
| 7. Práca je tak psychicky náročná, že po niekoľkých hodinách cítim nervozitu a roztrásenosť | 5 | 4 | 3 | 2 | 1 |
| 8. Po niekoľkých hodinách mám práce natoľko dosť, že by som chcel/a robiť niečo iného | 5 | 4 | 3 | 2 | 1 |
| 9. Práca je psychicky tak náročná, že po niekoľkých hodinách cítim únavu a ochablosť | 5 | 4 | 3 | 2 | 1 |
| 10. Práca je psychicky tak náročná, že ju nemožno robiť niekoľko rokov s rovnakým výkonom | 5 | 4 | 3 | 2 | 1 |

B. sekcia: Hodnotenie Vašej osobnosti ako profesionálneho pracovníka

1. Myslíte si, že spĺňate základné atribúty pre výkon tejto profesie? áno nie

2. Boli ste v poslednom roku pochválení za svoju prácu? áno* nie

*Ak áno, kým (uved'te všetky možnosti): vedenie HaZZ občan inak

Ak inak, kým:.....

3. Ste dostatočne motivovaní pre výkon svojej profesie?

áno, veľmi skôr nie

skôr áno nie

priemerne neviem posúdiť

4. V nasledujúcej tabuľke zhodnot'te sám seba ako hasiča na stupnici od 5-1.

	maximálne	veľa	stredne	trocha	vôbec nie
odbornosť v problematike	5	4	3	2	1
prirodená autorita	5	4	3	2	1
riadiace schopnosti	5	4	3	2	1
zmysel pre spravodlivosť	5	4	3	2	1
komunikatívnosť	5	4	3	2	1
trpezlivosť	5	4	3	2	1
dôslednosť	5	4	3	2	1
náročnosť	5	4	3	2	1

C. sekcia: Iné stresové situácie a ich zvládanie

1. Ovplyvňuje Vašu záchranársku činnosť nejaká negatívna životná udalosť? áno* nie

*Ak áno, uveďte aká(, pokiaľ je udalostí viac, uveďte všetky možnosti):

- úmrtie blízkeho človeka
- ochorenie u blízkeho človeka
- finančné problémy
- rodinné problémy
- iné, aké:.....
- odmietam odpovedať

2. Boli ste niekedy v minulosti šikanovaný zo strany zamestnávateľa? áno nie

3. Máte v svojom okolí blízkeho človeka, na ktorého sa môžete spoľahnúť? áno* nie

*Ak áno, uveďte koho(uveďte všetky možnosti):

- manžel, manželka
- kolegovia z práce
- priatelia
- pomáha mi viera
- deti

4. Uveďte, aké možnosti zvládania stresu preferujete? (uveďte všetky možnosti)

- lieky na spanie
- lieky na ukludnenie
- fajčenie
- alkohol
- hobby
- odpočinok(spánok, relaxácia)
- konzultácia s lekárom, event. so psychológom
- odborné techniky zvládania stresu
- vlastné osobné techniky zvládania stresu

6. Do nasledujúcej tabuľky, prosím vypíšte **3** Vami najčastejšie využívané techniky zvládania stresu (na odpoveď sa môžete inšpirovať otázkou č.4)

Poradie	Technika zvládania
1.	
2.	
3.	

Životný štýl

Táto časť dotazníka sa zameriava, aký je Váš celkový životný štýl. Svoju odpoveď pravdivo zaškrknite do príslušného okienka.

1. Raňajujete?

- áno, pravidelne každý deň,
- ako kedy, nepravidelne, a to(zakrúžkujte odpoveď) :
1x 2x 3x 4x 5x 6x/ týždeň
- nie, nikdy

2. Obedujete?

- áno, pravidelne každý deň,
- ako kedy, nepravidelne, a to(zakrúžkujte odpoveď) :
1x 2x 3x 4x 5x 6x/ týždeň
- nie, nikdy

3. Večeriare?

- áno, pravidelne každý deň
- ako kedy, nepravidelne, a to(zakrúžkujte odpoveď) :
1x 2x 3x 4x 5x 6x/ týždeň
- nie, nikdy

4. Kedy si dáte posledné jedlo dňa?

- do 17 hodiny
- 17- 18 hodina
- 19 hodina a neskôr

5. Pokiaľ konzumujete niečo po 19. hodine, čo si väčšinou dáte?

- sladkosť
- ovocie
- celozrnný chlieb, jogurt,...
- hranolčeky, chipsy, zmrzlina,...

6. Aké množstvo tekutín najčastejšie denne vypijete ?(l)

- menej než 1 l
- 1-2 l
- 2-3 l
- viac než 3 l

7. Aké nápoje najčastejšie preferujete?

- čaje, minerálne vody nesladené,
- čaje, minerálne vody sladené,
- limonády, coca-cola apod.
- iné, aké:

8. Vaša pohybová aktivita

- pravidelne každý deň
- ako kedy, nepravidelne, a to(zakrúžkujte odpoveď) :
1x,2x,3x,4x,5x,6x/týždeň
- nie, nikdy

Pokiaľ ste označili jednu z prvých 2 možností, ako dlho trvá 1 cvičenie?

- do 30 minút
- 30- 60 minút
- viac než 60 minút

Uved'te najčastejšie príklady svojej pohybovej aktivity:.....

Pokiaľ ste odpovedali „nie“, nikdy – chodíte aspoň pešo?

- áno*
- nie

*Ak áno, uved'te približný čas: minút

9. Ako často využívate počítač počas týždňa?

- pravidelne každý deň
- ako kedy, nepravidelne , a to(zakrúžkuj odpoveď) :
1x 2x 3x 4x 5x 6x/týždeň
- nie, nikdy

Pokiaľ ste označili jednu z prvých 2 možností, uved'te približný čas?

- do pol hodiny
- 1 - 2 hodiny
- 3 - 5 hodín
- 5 hodín a viac

10. Ako často sledujete televíziu počas týždňa?

- pravidelne každý deň
- ako kedy, nepravidelne , a to(zakrúžkujte odpoveď) :
1x 2x 3x 4x 5x 6x/týždeň
- nie, nikdy

Pokiaľ ste označili jednu z prvých 2 možností, uved'te približný čas?

- do pol hodiny
- 1 - 2 hodiny
- 3 - 5 hodín
- 5 hodín a viac

11. Fajčíte?

- pravidelne každý deň
- ako kedy, nepravidelne , a to(zakrúžkujte odpoveď) :
1x 2x 3x 4x 5x 6x/týždeň
- fajčil/ a som, ale prestal/a som
- nie, nefajčím

Pokiaľ ste odpovedali na jednu z prvých 2 možností, uveďte množstvo:.....ks/deň

Kvalita života podľa Svetovej zdravotníckej organizácie WHOQOL- BREF 26

Tieto otázky zisťujú, ako vnímate svoju kvalitu života, zdravia a ostatných životných oblastí. Berte pritom do úvahy, ako bežne žijete, svoje plány, radosti aj starosti. Pýtame sa na Vaš život za **posledné 2 týždne**. Máme teda na mysli posledné 2 týždne.

Prečítajte si láskavo každú otázku, zhodnoťte svoje pocity a zakrúžkujte u každej otázky to číslo stupnice, ktorá najlepšie vystihuje Vašu odpoveď.

1. Ako by ste hodnotil/a kvalitu svojho života?	veľmi zlá	zlá	ani zlá, ani dobrá	dobrá	veľmi dobrá
	1	2	3	4	5

2. Ako ste spokojný/á so svojim zdravím?	veľmi nespokojný/á	nespokojný/á	ani spokojný/á ani nespokojný/á	spokojný/á	veľmi spokojný/á
	1	2	3	4	5

Nasledujúce otázky zisťujú, ako moc ste prežívali behom posledných 2 týždňov určité veci.

	vôbec nie	trochu	stredne	veľa	maximálne
3. Do akej miery Vám bolesť bráni v tom, čo potrebujete robiť?	1	2	3	4	5
4. Ako moc potrebujete lekársku starostlivosť, aby ste mohli fungovať v každodennom živote?	1	2	3	4	5
5. Ako moc Vás teší život?	1	2	3	4	5
6. Nakoľko sa Vám zdá, že má Vaš život zmysel?	1	2	3	4	5

7. Ako sa dokážete sústrediť?	1	2	3	4	5
8. Ako bezpečne sa cítite vo svojom každodennom živote?	1	2	3	4	5
9. Aké zdravé je prostredie, v ktorom žijete?	1	2	3	4	5

Nasledujúce otázky zisťujú, v akom rozsahu ste robili, alebo mohli robiť určité činnosti v posledných 2 týždňov.

	vôbec nie	trochu	stredne	veľa	maximálne
10. Máte dosť energie pre každodenný život?	1	2	3	4	5
11. Dokážete akceptovať svoj telesný vzhľad	1	2	3	4	5

12. Máte dosť peňazí k uspokojeniu vlastných potrieb?	1	2	3	4	5
13. Máte prístup k informáciám, ktoré potrebujete pre svoj každodenný život?	1	2	3	4	5
14. Máte možnosť venovať sa svojim záľubám?	1	2	3	4	5

15. Ako sa dokážete pohybovať?	veľmi zle	zle	ani zle, ani dobre	dobre	veľmi dobre
	1	2	3	4	5

Ďalšie otázky sa zameriavajú na to, ako ste bol/a šťastný/á, alebo spokojný/á s rôznymi oblasťami svojho života v posledných 2 týždňov.

	veľmi nespokojný/á	nespokojný/á	ani spokojný/á ani nespokojný/á	spokojný/á	veľmi spokojný/á
16. Ako ste spokojný/á so svojim spánkom?	1	2	3	4	5

17. Ste spokojný/á so svojou schopnosťou prevádzať každodenné činnosti?	1	2	3	4	5
18. Ako ste spokojný/ so svojim pracovným výkonom?	1	2	3	4	5
19. Ako ste spokojný/á sám/sama so sebou	1	2	3	4	5
20. Ako ste spokojný/á so svojimi osobnými vzťahmi?	1	2	3	4	5
21. Ako ste spokojný/á so svojim sexuálnym životom?	1	2	3	4	5
22. Ako ste spokojný/á s podporou, ktorú Vám poskytujú priatelia?	1	2	3	4	5
23. Ako ste spokojný/á s podmienkami v mieste, kde žijete?	1	2	3	4	5

24. Ako ste spokojný/á s dostupnosťou zdravotnej starostlivosti?	1	2	3	4	5
25. Ako ste spokojný/á s dopravou?	1	2	3	4	5

Nasledujúca otázka sa týka toho, ako často ste prežívali určité veci behom posledných 2 týždňov.

	nikdy	niekedy	stredne	celkom často	neustále
26. Ako často prežívate negatívne skúsenosti, napr. namrzenosť, beznádej, úzkosť, depresia?	1	2	3	4	5

Ďakujem za vyplnenie dotazníka