EXAMINATION OF FACTORS INFLUENCING WORK CAPACITY AMONG PHYSICAL WORKERS

Doctoral (PhD) thesis theses

Kovács Miklós

University of Pécs

Faculty of Medicine

Pecs

2025.

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1. ABBREVIATIONS

AIS:	Athens Insomnia Scale
BDI:	Beck's depression abridged questionnaire
CBI:	Copenhagen Burnout Inventory
OVER:	Maslach burnout inventory
MOLBI:	Mini Oldenburg Burnout Inventory
OLBI:	Oldenburg Burnout Inventory
PD-Q:	PainDETECT questionnaire
EQ-5D:	Health-related quality of life
CBI:	Copenhagen Burnout Inventory
MBI-HSS	Maslach Burnout Inventory-Human Services Survey
MBI-GS	Maslach Burnout Inventory-General Survey
CESQT	Questionnaire for the Evaluation of Burnout Syndrome
BCSQ	Burnout Clinical Subtypes Questionnaire
BEATS	Burnout Assessment Tool
SMBQ	Shirom–Melamed Burnout Questionnaire
MBI-HSS	Maslach Burnout Inventory-Human Services
PBI	Psychologist's Burnout Inventory
SBI	School Burnout Inventory

2. INTRODUCTION

If work and professional environments are not properly organised and managed, this can have serious consequences for workers. Their negative effects often deplete the individual and adversely affect (among other things) his psychological resources. Burnout has become an increasingly significant psychosocial risk in today's society, placing a heavy burden on both individuals and society (1–4). Although initially those who performed a (social) helping role in their work were considered to be at risk of burnout, later studies/studies show that this syndrome can develop in all kinds of professions and occupational groups (5-7). Estimates of burnout frequency vary significantly depending on the definition or questionnaire used to describe burnout. For example, a national study among U.S. general surgery residents found estimates ranged from 3.2% to 91.4%, with 43.2% of respondents experiencing symptoms weekly (8). Despite the fact that burnout is an increasingly prominent and intensively researched field and is closely linked to many mental and physical diseases, in the latest classification of the International Classification of Diseases (ICD-11) it was classified not as a disease but as an occupational health concept.

However, the recognition (and potential) treatment of burnout is taken into account by legal directives, such as the European Union Health and Safety Framework Directive (89/391/EEC). Although occupational health is a less respected area in our country, due to the COVID-19 pandemic, it is perhaps more relevant now than ever. The pandemic has placed a particularly significant psychological burden on healthcare workers. Since the outbreak of COVID-19, many studies on burnout have involved frontline healthcare workers, doctors, nurses or pharmacists (9–12). However, the different methodology and lower sample size of pre-pandemic studies make it difficult to compare changes in prevalence (in the same populations), especially considering that the studies performed (neither previous nor current studies) are predominantly representative. Studies examining the effects of previous epidemics (e.g., SARS, flu, or Ebola outbreaks) also demonstrate that, in addition to infection, there are long-term cognitive and mental health effects among healthcare workers that may increase the incidence and extent of burnout (e.g., emotional distress, post-traumatic stress disorder) (13). Teleworking full-time due to COVID-19 and its association with burnout are also the subject of intensive research (14–17). Burnout of educators is also increasingly coming to the fore (18-21). In addition, parents working at home or staying at home with their children for a long time may also experience or have experienced high levels of stress (especially during the pandemic), which can lead to parental burnout (22,23).

2.1. Burnout

Overall, burnout syndrome is an individual response to chronic work-related stress that develops gradually and can eventually become chronic, causing adverse health changes (24). From a psychological point of view, this syndrome causes harm to the individual at the cognitive, emotional and attitudinal levels, which provokes negative behavioral characteristics. These negative behavioural traits can also have an adverse impact on work, cooperation with colleagues and professional success (25). However, these behaviours are not always personal, innate behaviours, but can also be a consequence of burnout syndrome in the course of work activities (26). Historically, Graham Greene was the first author to use the term burnout in his novel "A Burnt-Out Case" when describing the story of an architect who could not find meaning in his profession and joy in life. The term was later adopted and introduced by Freudenberger as a psychological concept, where he described burnout as a state of exhaustion, fatigue, and frustration due to a professional activity that does not develop as expected (27). Initially, Freudenberger related this concept exclusively to the hospital volunteer caregivers he studied, who dealt with people with various mental disorders and social problems. These workers experienced constant exhaustion and demotivation due to their occupation. Subsequently, perhaps the best-known researcher of burnout, Maslach introduced burnout syndrome into the scientific literature, defining it as a process of fatigue, cynicism, and decreased performance (28). Years later, after numerous empirical studies, Maslach and Jackson redefined the concept and developed the definition most characteristic of burnout as a psychological syndrome characterized by emotional exhaustion, depersonalization, and decreased sense of professional efficiency (5) (Table 1).

Dimension	Definition
Emotional exhaustion	The dimension is characterized by the fact that the employee reports (mental) fatigue and exhaustion due to challenges at work. Workers find it difficult to adapt to the work environment because they do not have enough emotional energy to cope with tasks.
Cynicism or depersonalization	The dimension is characterized by the fact that the individual begins to isolate, become indifferent and lose interest in work and people. It manifests itself in negative attitudes and behaviors, irritability, loss of idealism.
Reduced personal performance	The dimension is characterized by low professional self-esteem and uncertainties about the effectiveness and efficiency of the work performed. As a result, productivity decreases, morale and resilience are lowered.

Table 1. Burnout symptoms (Source: Reference 5)

However, some authors have argued that these three dimensions are not completely independent, and different ideas have been put forward to explain this. The difference between them lies in which is the first dimension that appears. Although clear evidence is currently not available, longitudinal studies have shown that there is a causal order between key dimensions of burnout. Thus, high levels of emotional exhaustion lead to cynicism or depersonalization (29). Similarly, it seems clear that exhaustion and depersonalization are basic/key dimensions of work-related burnout syndrome, while lack of professional success can be considered a precursor or even a consequence of burnout (30). Although Maslach and Jackson's concept of burnout remains the most widespread and accepted in the scientific literature, other definitions and approaches have emerged on the subject. For example, Salanova et al redefine these approaches and propose an extended model of burnout, consisting of: (1) exhaustion (associated with failures in the relationship between the individual and work in general), (2) mental distancing (negative attitudes towards work) and depersonalization (distancing from the people for whom and with whom you work) and (3) professional ineffectiveness (tasks are inadequate and feeling inadequate at work) (31).

2.2. Subtypes of burnout

As an alternative to a unified definition of burnout, Montero-Marín suggests that this syndrome does not occur in the same way in all cases (24). According to his idea, there are three variations, depending on how committed employees are to their work (Figure 1). These subtypes can also be interpreted as workers gradually losing commitment to their work, and this has an important impact on the choice of intervention strategies to be used (32). From a theoretical point of view, burnout can be seen as a dynamic state in which the level of commitment and enthusiasm gradually decreases and eventually apathy develops (24). Subtypes of burnout and their features:

"Frenetic" type: People of this type are completely subordinate to their work, often overwork themselves, work tirelessly to exhaustion. They are the ones who are extremely ambitious, highly committed to their work and almost workaholic. They usually perform well and put all their energy into the work. Unsurprisingly, this type of burnout is closely related to long working hours, split shifts, temporary contracts. This type of profile is often associated with high levels of burnout and work-life imbalance.

"Underwhelmed" type: These types of people are less involved in their work. For them, boredom and lack of personal development are characteristic. They are often cynical, not because of their personality, but because of their dissatisfaction. For the underwhelmed burned-out subtype, monotonous and less stimulating jobs involving repetitive, mechanical and routine tasks are characteristic. As a result, employees feel indifferent, boredom and lack of personal development, which often leads them to look for another job. This subtype is associated with a high level of cynicism, as employees cannot identify with work tasks and therefore use escape and coping strategies.

"Worn" type: These people have been in the same position for a long time and have lost motivation for their work. In this case, over the years, the tendency to burnout increases significantly when working in the same position. Often the fact that they do not receive enough recognition for their work also contributes to the development of this condition. They often feel ineffective and use passive coping strategies. In this type, a stable relationship and having children can be mitigating factors.

Burnout is usually characteristic of the frenetic subtype, where the person has excessive commitment. Because this pace of work can be difficult to maintain without feeling exhausted/exhausted, workers tend to keep a certain distance from each other. However, social distancing can hinder expected performance and cause frustration. In the long run, this feeling can

lead to a decrease in efficiency, giving way to passive coping strategies (which usually appear in the exhausted subtype). The development of burnout and parallels between different subtypes raise new therapeutic intervention options that treat subtypes as different stages of burnout (24). Empirical studies also suggest a gradual deterioration from a frenetic state to an underwhelmed and exhausted state (33). However, the phenomenon is not yet fully understood, and further studies are needed to draw appropriate conclusions.

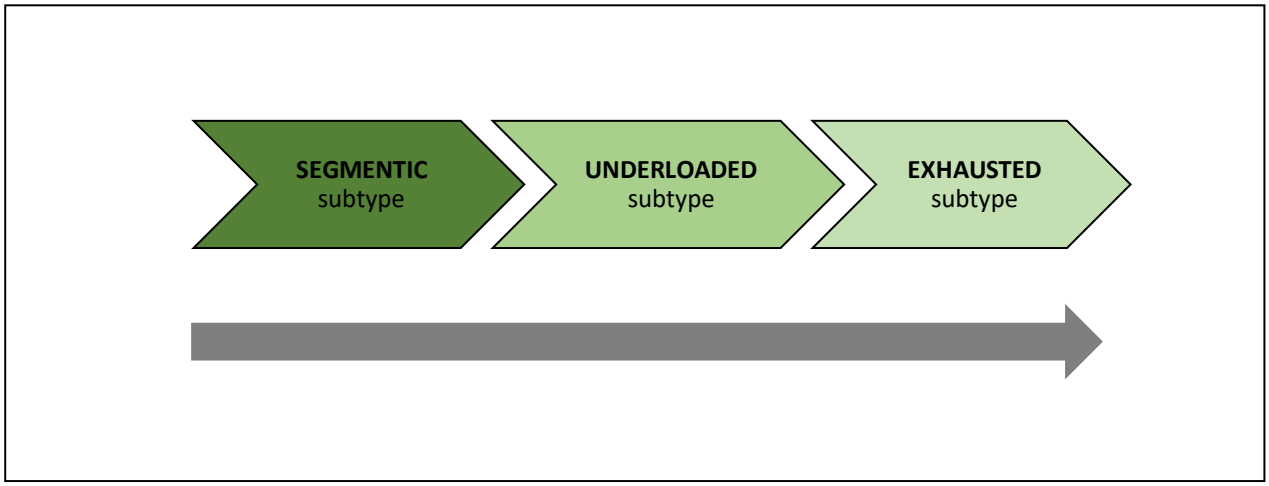

Figure 1. Subtypes of burnout. (Source: Reference 32)

2.2.1. Social cognitive theory

This approach is characterized by the central role of individual variables such as self-efficacy, self-confidence, and self-concept in the onset and development of burnout (34,35). So, this syndrome appears when employees feel insecurity about their own or their team's effectiveness (36,37). The theoretical background was supported by a Spanish study involving some 274 secondary school teachers. Research has shown that burnout usually occurred after the onset of professional efficiency crises experienced (36). Circumstances conducive to ineffectiveness or professional inefficiency crises include: past experiences of failure, missing reference models or examples that could help deal with such situations, lack of external reinforcement or recognition, incomplete feedback or excessive criticism, difficulties at work (38). In this way, professional efficiency crises can lead to reduced work performance. If this condition persists for a long time, it can lead to emotional exhaustion, which can later lead to cynicism or depersonalization (Figure 2).

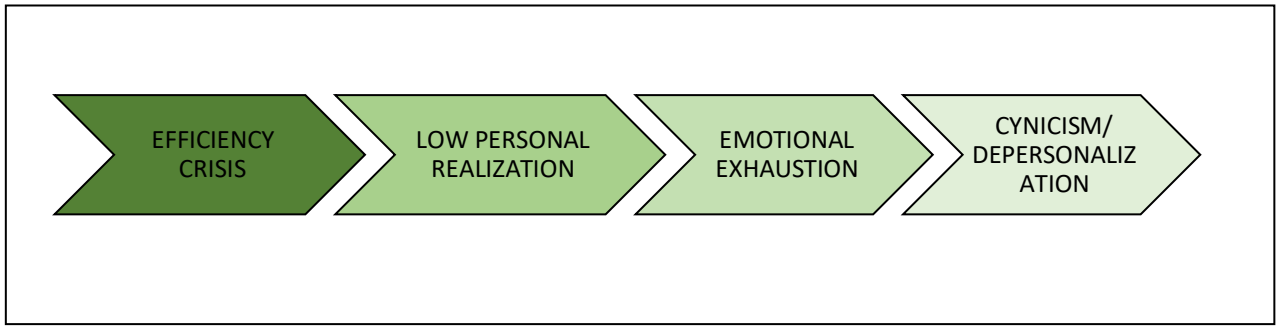

Figure 2. The development of burnout according to the socio-cognitive theory of self-efficacy. (Source: Reference 36)

2.2.2. Social exchange theory

According to the theory, burnout occurs when an employee feels that there is an inadequate balance between the effort invested and the results achieved in their work (39). This may be due to the lack of reciprocity that can occur in service users, co-workers, managers. Lack of reciprocity can deplete people's emotional resources and cause emotional exhaustion that becomes chronic. This type of burnout is triggered by significant interpersonal needs that arise when dealing with clients. In order to avoid these discomforts, employees use depersonalization or cynicism as a stress management strategy, which can eventually lead to reduced personal performance (Figure 3).

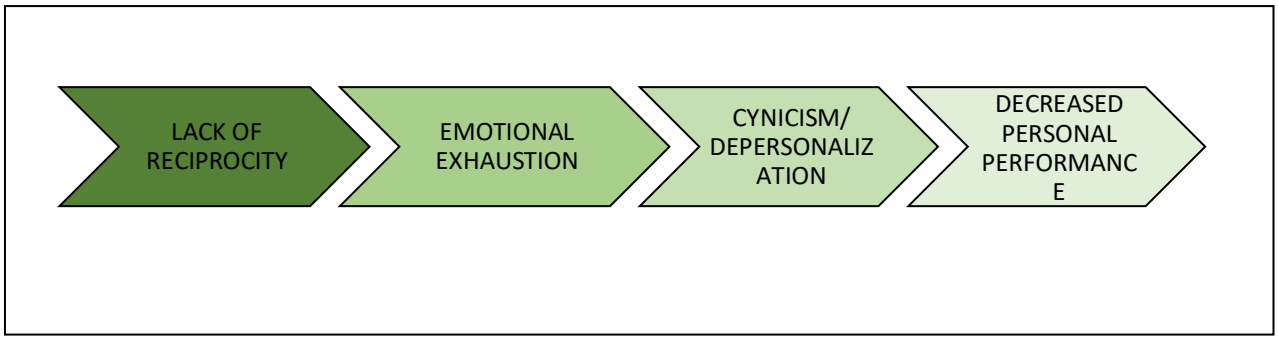

Figure 3. The development of burnout according to his theory of social exchange. (Source: Reference 39)

2.2.3. Organization theory

This approach believes that burnout is the result of organizational and workplace stressors and inadequate individual coping strategies (40,41). Within this theory, there are two alternative models for explaining the relationships between the dimensions of burnout. According to

Golembiewski and colleagues, burnout occurs when organizational stressors and/or risk factors are present, such as job overload or job insecurity. In such cases, some individuals use a coping strategy that results in a decrease in their commitment to the organization. This phenomenon is very similar to the process of cynicism and depersonalization (41). As a result of this process, the employee's sense of satisfaction decreases and he experiences emotional exhaustion at work, which leads to burnout. Thus, depersonalization becomes the first phase of burnout, followed by performance degradation and finally emotional exhaustion. Based on the other model, published by Cox et al., emotional exhaustion caused by long-term work-related stress is an initial dimension of the syndrome (40). Depersonalization is seen as a coping strategy against emotional exhaustion, resulting in low professional performance.

2.2.4. Needs – resource theory

According to the theory, burnout occurs when there is an imbalance between the requirements and resources arising from work (42). Work requirements are tasks that require constant physical or mental effort and involve the activation of the pituitary-pituitary-adrenal axis, among other things. This could be, for example, long hours of concentration or working under pressure at work. Overwork, emotional work, time constraints and interpersonal conflicts are common phenomena in the world of work. If an individual is unable to manage stress and expectations effectively, it can have a negative impact on both their physical and mental health. Work resources can be organizational or personal (Table 2). When demands persistently exceed resources, fatigue occurs, which becomes chronic over time and eventually burnout syndrome appears. Therefore, work requirements have a direct relationship with burnout, especially emotional exhaustion, while the presence of labor resources is inversely proportional to depersonalization, minimizing or reducing its use as a stress management strategy.

Work requirements	Work resources
Transient pressure	Technical knowledge and skills
Interpersonal conflicts with clients and colleagues	Social-emotional skills
The complexity of the task	Positive psychological capital (self-efficacy, optimism, hope and resilience)
Job insecurity	Creativity
Unfavorable schedule changes	Organizational time and flexibility
Overwork	Safety at work
Hazards associated with a particular job	Driver support
	Material resources
	Autonomy
	Rewards

Table 2. Summary of the main work requirements and labor resources. (Source: Reference 42)

2.2.5. Structural theory

According to this approach, burnout occurs because an individual cannot effectively cope with chronic work-related stress. At first, an individual tries to use different methods of dealing with sources of stress. If these strategies do not work, it can lead to professional failure with a consequent self-esteem problem (spoiling each other), which ultimately leads to emotional exhaustion. Confronted with the above, the individual may use various coping mechanisms, which include depersonalization (Figure 4). Depersonalization means that an individual at work begins to distance himself from others and simplifies or minimizes his emotional attitude and relationships. The employee is trying to reduce negative feelings and stress, but this long-term coping strategy can exacerbate the situation and increase the risk of burnout. This model was studied for different jobs, most notably teachers or nurses (43).

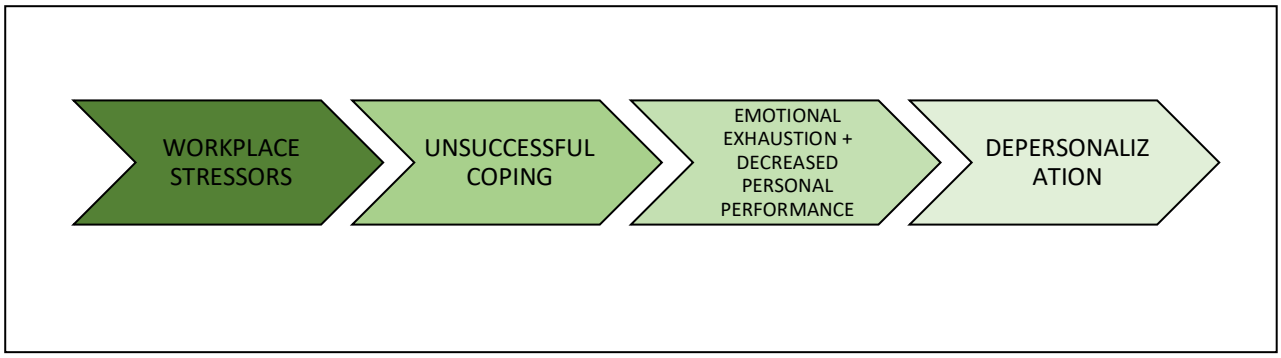

Figure 4. The development of burnout according to structural theory. (Source: Reference 43)

2.2.6. Theory of workplace interactions

Work-related interaction refers to people's tendency to automatically imitate and synchronize facial expressions, sounds, postures, and movements, and as a result, become emotionally aligned with the people they are imitating (44). When people work together in teams, they often share their feelings, experiences, and reactions to work-related stress or other challenges. Because of this, collective emotions, such as sadness, fear, or exhaustion, can spread and become common among employees. These shared feelings and experiences can contribute to belief systems and interactions in working groups that can increase the risk of burnout. For example, a general acceptance of overwork or workplace exhaustion in a group may contribute to burnout occurring more easily (38). These interactions are mainly in professions where emotional work and stress are more prevalent, such as teachers, medical staff or other helping professions. Individuals in these professions often face high levels of work-related stress and emotional strain, which can increase the likelihood of burnout (45). This emotional transfer can occur not only at work, but also in a home environment, such as between a spouse or other family members (26,46).

3. OBJECTIVES

My doctoral thesis basically covers three main topics. In the first part, I discuss the results of the complex analysis of burnout, and in the second part I present the experiences of the complex assessment of low back pain associated with the neuropathic component. The third part focuses on analysing the efficiency and effectiveness of ergonomic aids, with a particular focus on workers suffering from chronic low back pain. The complex research results of all these topics are presented on the basis of studies conducted among large corporate employees.

3.1. Complex study of burnout among large corporate employees

Our research examined in detail the phenomenon of burnout among large corporate employees and its various correlations, with special regard to demographic factors and working conditions. Our goal was to understand what factors play a role in burnout in this work environment and to identify risk factors that may increase the risk of burnout. Our results may contribute to the development of more effective methods to prevent and treat burnout.

3.2. Investigation of the relationship between burnout and neuropathic low back pain

Our research examined the relationship between burnout and neuropathic low back pain in detail, especially in jobs where nociceptive, mixed or neuropathic pain is common. We analyzed the frequency and severity of low back pain and its relationship to demographic factors such as age and gender. In addition, we examined what work conditions, such as remuneration or working time arrangements, play a role in the development of neuropathic low back pain. We focused on the links between neuropathic pain and burnout and other psychological problems to identify risk factors for pain and contribute to the development of more effective treatment methods.

3.3 Complex assessment of the use of ergonomic aids among workers suffering from chronic low back pain

Our research focused on a comprehensive study of the use of ergonomic aids among workers suffering from chronic low back pain. Our goal was to evaluate the effectiveness of these aids among those engaged in physical work, with special regard to reducing lower back and spine pain. Ergonomic aids are designed to support the spine, prevent forced postures and thereby reduce load and pain during work. In addition, the role of psychosocial factors and the placebo effect in pain relief was also examined. In our research, we compared several tools to understand their benefits and limitations, especially in maintaining and improving the working capacity of older workers. Our ultimate goal was to develop a complex workplace screening program that could facilitate the effective introduction and application of ergonomic aids, contributing to increasing competitiveness.

4. COMPLEX STUDY OF BURNOUT AMONG LARGE CORPORATE EMPLOYEES

Burnout is one of the most widely studied phenomena of the 21st century. It mostly affects individuals whose jobs require interpersonal relationships and empathy (such as health and education), but can extend to all kinds of professions (47). According to current data, burnout is a condition in which an individual experiences emotional, mental and physical exhaustion as a result of long-term emotional stress and load. This is often associated with behavioral and self-esteem disorders, as well as impaired coping strategies (48,49). In the course of our literature investigation, we found relatively few studies involving workers in manual jobs, and no study had dealt with the postal delivery network before, so the aim of our study was to examine burnout among them in a complex way.

The phenomenon of burnout was originally widely studied in the field of support services, but today it is universally applicable to any occupation. Based on our knowledge and literature research,

it can be concluded that similar studies have not been conducted before among employees of large companies covered by the research topic.

We conducted a questionnaire survey to see how often burnout occurs among large enterprise workers. The survey took into account demographic factors such as gender, age, marital status, number of children, length of employment and the existence of a second job. In addition, we analyzed the role of risk factors such as smoking, alcohol consumption, drug use, diabetes, hypertension, cardiovascular disease, musculoskeletal pain and depression. We paid special attention to the possible relationship between depression, insomnia and quality of life, and how these are related to burnout.

4.1. Subjects and methods

This cross-sectional questionnaire epidemiological study was carried out between May 2021 and January 2022 among employees of Magyar Posta's delivery/logistics network in five counties of Hungary. The examination protocol was approved by the Ethics Committee of the University of Pécs and confirmed by the management of Magyar Posta (reference number: PTE/96773-2/2018). Participation in the questionnaire-based epidemiological study was anonymous and voluntary.

One of the most important factors in the implementation of postal and courier activities is the work carried out within the postal network. This activity is extremely diverse, ranging from the work of postal carriers to mobile postal services. Magyar Posta Zrt.'s nationwide network includes more than 2,700 post offices, hundreds of mobile mail flights, 12 manual mail processing points, an International Post Exchange Centre, a Hírlap Logistics Plant, a Complex Logistics Services Plant and the National Logistics Centre in Budaörs, where consignments are transported, sorted and delivered. Magyar Posta's Directorate-General for Human Resources has traditionally paid special attention to preserving the working capacity of employees in the delivery area (51).

The study conducted in Magyar Posta's network area was open to employees between the ages of 18 and 65, who worked as delivery workers and signed the declaration of consent.

Those who did not meet the age limit, did not work as a delivery man or did not consent to the investigation were excluded from participation.

The demographics taken into account in the study included gender, age, marital status, number of children, length of employment, number of previous jobs and the existence of a second job.

Risk factors considered in the study included smoking, alcohol and drug use. Health factors examined included: diabetes, hypertension, ischaemic heart disease, history of musculoskeletal pain and depression.

Burnout was measured using the Mini Oldenburg Burnout Inventory (MOLBI), which has powerful psychometric properties to measure burnout at work (50,52,53). The advantage of the questionnaire is that it can be used as a universal measuring tool for any profession and is designed specifically to eliminate criticisms of the content and theory of the MBI questionnaire. These statements are specific and their number is evenly distributed within each scale (positive and negative elements are present in equal proportions). The questionnaire measures burnout along two dimensions: exhaustion, work-related fatigue, and emotional, cognitive and physical strain on work. The disillusionment scale measures loss of interest in work, depersonalization of work, loss of commitment, and possible cynicism. Half of the statements are formulated in reverse, and the answers are scored on a four-grade Likert scale. High scores indicate the degree of burnout on both subscales (55). A person was considered burned out if this could be said on the basis of both subscales. This questionnaire has also been validated in Hungarian.

The presence and severity of depression was investigated using an abbreviated version of the Beck Depression Inventory (BDI-SF) (54,57). This questionnaire contains 9 items related to the following symptoms: social isolation, indecision, sleep disturbance, fatigue, excessive worry about physical symptoms, inability to work, pessimism, dissatisfaction and lack of pleasure. The scale is scored from 1 to 4 and we can distinguish between absence (0-9 points) and presence (>10 points) in the patients studied. Depression can be classified into mild (10-18 points), moderate (19-25 points) and severe (≥26 points). This questionnaire was also validated in Hungarian (57).

Sleep disturbance was assessed using the Athens Insomnia Scale (AIS) (56), a questionnaire consisting of eight questions, five of which measure nighttime symptoms (difficulty falling asleep and falling asleep early) and three of which ask about daytime consequences. The higher the score, the worse the quality of sleep (up to 24 points are possible). A score of 10 indicates clinically significant insomnia (56). This questionnaire has also been validated in Hungarian.

Quality of life was determined using the EQ-5D (health-related quality of life) self-completion questionnaire, which is widely available in several languages. The questionnaire measures 5 dimensions (mobility, self-care, daily routines, pain/discomfort and anxiety/depression) with statements corresponding to a 3-point scale (58,59,60).

4.2. Statistical analysis

The data were analyzed using descriptive statistics tools, T-test, $\chi 2$-test, correlation analysis and logistic regression analysis.

4.3. Results

In total, more than 1300 questionnaires were sent out to which 1034 replies were received (79.5% response rate). 368 men (35.6%) and 666 women (64.4%) participated in our study. 43.9% of the workers surveyed were aged between 46 and 55. 764 (73.89%) were married or in a relationship. The number of workers without children was 236 (22.8%). The vast majority of our study population (45.8%) have been working for 21-40 years. 58 participants (5.6%) had a second job. The basic data are shown in Table 3.

(N=1034)	**%**
No	
Woman	64,4 (666/1034)
Man	35,6 (368/1034)
Age	
18-25 years	4,0 (41/1034)
26-35 years	13,3 (138/1034)
36-45 years	23,5 (243/1034)
46-55 years	43,9 (454/1034)
56-62 years	13,7 (142/1034)
more than 62 years	1,6 (16/1034)
Marital status	
single	12,9 (133/1034)
In relation to	17,1 (177/1034)
married	56,8 (587/1034)
divorced / widowed	13,2 (136/1034)
Number of children	
childless	22,8 (236/1034)
1 child	26,0 (269/1034)
2 children	37,2 (385/1034)
more than 3 children	13,9 (144/1034)

Years of work	
1-12 months	4,5 (45/1034)
1-5 years	20,3 (210/1034)
6-10 years	10,3 (107/1034)
11-20 years	17,5 (181/1034)
21-30 years	25,6 (265/1034)
31-40 years	19,9 (206/1034)
more than 40 years	1,9 (20/1034)
Number of jobs	
1.	40,0 (414/1034)
2.	19,0 (196/1034)
3.	17,7 (183/1034)
4.	9,1 (94/1034)
5. or more than 5.	14,2 (147/1034)
Second job	
No	94,4 (976/1034)
Again	5,6 (58/1034)

Table 3. Baseline sociodemographic data of the study population. (Source: author's own edit)

445 participants (43.0%) regularly took medications, 299 participants (28.9%) smoked, 91 participants (8.8%) consumed alcohol, and 34 participants (3.3%) used drugs. High blood pressure occurred in 305 participants (29.5%) and muscle pain was experienced in 185 participants (17.9%). Ischaemic heart disease was detected in 124 participants (12.0%), while 62 participants (6.0%) had diabetes (Table 4).

(N=1034)	**%**
Risk factors	
regular medication	43,0 (445/1034)
smoker	28,9 (299/1034)
alcohol consumption	8,8 (91/1034)
drug abuse	3,3 (34/1034)
Diseases	
diabetes	6,0 (62/1034)
hypertension	29,5 (305/1034)
ischemic heart disease	12,0 (124/1034)
musculoskeletal pain	17,9 (185/1034)
depression	4,9 (51/1034)

Table 4. Risk factors and previous diseases in the study population. (Source: author's own edit)

The incidence of burnout was 50.8% in this study population (525/1034, mean score 2.74 ± 0.33). The rate of emotional exhaustion turned out to be 52.8% (546/1034, average score: 2.3 ± 0.52), while the rate of disillusionment was 78.9% (816/1034, average score: 2.5 ± 0.58). 36.2% (375 people) of participants had no depression, 56.6% (585 people) had mild depression, 6.2% (64 people) had moderate depression, and 1% (10 people) had major depression. The incidence of sleep disorders was 17.9% (185/1034), while the incidence of severe insomnia was 4.6% (48/1034) (Table 5).

(N=1034)	**%**
Burnout	
Burnout	50,8 (525/1034)
emotional exhaustion	52,8 (546/1034
disappointment	78,9 (816/1034)
Depression	
No	36,2 (375/1034)
Mild	56,6 (585/1034)
moderate	6,2 (64/1034)
Serious	1,0 (10/1034)
Sleep disorder	
No	77,5 (801/1034)
From	17,9 (185/1034)
Serious	4,6 (48/1034)

Table 5. Distribution of burnout, depression and insomnia in the study population. (Source: author's own edit)

Burnout was associated with female gender (66.7% vs. 55.8%, p=0.038), career start (first job) (44.6% vs. 26.9%, p=0.0013), employment aged 31-40 and over 40 (19.8% vs. 12.7%, p=0.001, 2.9% vs. 1.5%, p=0.045) (Table 6).

(data %) N=1034)	**No burnout (197/1034)**	**Burnout (525/1034)**
No		
Woman	55,8 (110/197)	66,7 (350/525) *
Man	44,2 (87/197)	33,3 (175/525)
Age		
18-25 years	4,6 (9/197)	3,8 (20/525)
26-35 years	15,7 (31/197)	11,6 (61/525)
36-45 years	26,9 (53/197)	25,3 (133/525)
46-55 years	38,6 (76/197)	45,2 (237/525)
56-62 years	12,7 (25/197)	12,4 (65/525)
more than 62 years	1,5 (3/197)	1,7 (9/525)
Marital status		
single	11,7 (23/197)	14,3 (75/525)
In relation to	19,3 (38/197)	16,2 (85/525)
married	56,3 (111/197)	57,1 (300/525)
divorced / widowed	12,7 (25/197)	12,4 (65/525)
Number of children		
they have no children	26,4 (52/197)	21,7 (114/525)
1 child	26,9 (53/197)	25,1 (132/525)
2 children	34,0 (67/197)	37,9 (199/525)
more than 3 children	12,7 (25/197)	15,2 (80/525)

Workplace		
1.	26,9 (53/197)	44,6 (234/525) *
2.	25,4 (50/197)	16,0 (84/525)
3.	20,8 (41/197)	16,8 (88/525)
4.	11,2 (22/197)	8,6 (45/525)
5. or more than 5	15,7 (31/197)	14,1 (74/525)
Years of work		
1-12 months	5,1 (10/197)	5,0 (26/525)
1-5 years	28,4 (56/197)	17,7 (93/525)
6-10 years	12,2 (24/197)	9,5 (50/525)
11-20 years	17,3 (34/197)	18,5 (97/525)
21-30 years	22,8 (45/197)	26,7 (140/525)
31-40 years	12,7 (25/197)	19,8 (104/525) *
more than 40 years	1,5 (3/197)	2,9 (15/525) *
Secondary employment		
No	92,9 (183/197)	94,5 (496/525)
Again	7,1 (14/197)	5,5 (29/525)

Table 6. Relationship of burnout to sociodemographic parameters (*p<0.05). (Source: author's own edit)

Burnout was more common among those with a history of musculoskeletal pain (17.3% vs. 8.6%, p=0.003) or depression (7.6% vs. 3.5%, p=0.048). Interestingly, smoking had a protective effect (26.1 vs. 33.5%, p=0.033) (Table 7).

(data %) N=1034	**No burnout (197/1034)**	**Burnout (525/1034)**
Comorbidity		
regular medication	45,2 (89/197)	42,5 (223/525)
smoker	33,5 (66/197)	26,1 (137/525) *
alcohol consumption	10,7 (21/197)	8,6 (45/525)
drug abuse	4,1 (8/197)	2,9 (15/525)
diabetes	7,6 (15/197)	6,5 (34/525)
hypertension	30,5 (60/197)	28,0 (147/525)
ischemic heart disease	10,2 (20/197)	11,2 (59/525)
musculoskeletal pain	8,6 (17/197)	17,3 (91/525)*
History of depression	3,5 (7/197)	7,6 (40/525)*

Table 7. The relationship of burnout with risk factors and disease history. (Source: author's own edit)

There was a significant association between burnout and severe sleep disturbance (7.1% vs. 2.7%, $p<0.001$), moderate depression (12.7% vs. 3.3%, $p=0.003$), and lower quality of life (84.74 vs. 81.07, $p=0.016$) (not visible).

In the logistic regression analysis, which included all factors (demographic criteria, burnout, depression, comorbidity, sleep disturbance), predictors of burnout were female gender (OR = 2.380, $p = 0.037$), career start (OR = 1.891, $p = 0.03$) and more than 30 years of work (OR = 1.901, $p = 0.006$). Musculoskeletal pain (OR = 1.156, $p = 0.038$), quality of life (OR = 1.602, $p = 0.002$) and sleep disturbance (OR = 1.289, $p = 0.020$) were also found to be independent factors.

4.4. Discussion

To our knowledge, our study was the first study that focuses on the burnout of postal logistics workers using a complex methodology.

Burnout is an increasingly common phenomenon nowadays, affecting primarily those working in helping professions, whose daily work requires more empathy and patience (61,62). Despite its increasing prevalence and negative impact on a person's health (depression, sleep disturbance, anxiety, etc.), it is still not considered a health condition. As a result, there are no clear guidelines for objectively measuring and treating burnout. Burnout can have somatic and psychological complications, and can also negatively affect a person's social status. The biggest challenge is preventing burnout (63,64).

The incidence of total burnout in the study population was 50.8%, which is somewhat surprising compared to data from healthcare professionals (who tend to be the most vulnerable) (65.66).

The high rate of burnout can be compared to other studies that have focused on different employee populations (67.68). Similarly to the previous situation of healthcare workers, the wages of delivery workers are not outstanding, they reach the same level as the Hungarian average, and in addition, workers often feel overwhelmed with their work, which may explain the higher burnout rates.

The female gender was an independent predictor of burnout in our current study. This may be because women are responsible for much of the housework and childcare in addition to work, so they become emotionally exhausted sooner (69). According to Eurostat results, in almost all Member States of the European Union there is a significant difference in the time spent on domestic and family care activities in favour of women (69).

Career start-ups played a role in burnout, which is not surprising as career entrants tend to be less experienced, lack routine in the job and have a harder time coping with increasing stress (70).

There are conflicting results in the literature regarding the impact of working years on the incidence of burnout (71,72). In our study population, those who had worked for more than 30 years saw a significant increase in burnout, which remained an important predictor of the phenomenon. The fact that someone has no previous work experience or is working at their first job can predict that they are more likely to encounter difficulties at work and burnout. This highlights the importance of workplace prevention strategies to help workers adapt, evolve and effectively address workplace challenges.

In the research, smoking was a protective factor against burnout. This is somewhat contradictory compared to previous results, as it was little or positively associated with higher burnout rates (73.74). Smoking is probably a form of stress management method for those close to burnout. We hypothesize that higher smoking rates may be due to increased stress, but these workers are not yet completely burned out, but are at the beginning of the process. However, the relationship was only represented in univariate analysis, not in multivariate analysis.

Musculoskeletal pain was significantly associated with burnout in both univariate and multivariate analysis. Delivery drivers often adopt incorrect postures due to static work positions, lacking the necessary dynamic force for fine motor movements. In addition, increasing stress and consequent physical and mental exhaustion can increase cortisol production, leading to muscle tension, reducing strength and mobility (75,76).

The incidence of depression was also higher among workers with burnout. In addition, the severity of depression was closely related to the degree of burnout. Depression is a condition that negatively affects all areas of life, thereby becoming a significant social burden. It is estimated that by 2030 it will be the leading cause of disability and one of the leading causes of death due to increased suicide rates (77). The question often arises whether burnout and depression are similar phenomena, but a recent meta-analysis clearly describes them as separate entities (78). Based on the results of our multivariate analysis, neither depression nor mood disorder showed a significant association with burnout (79).

The impact of burnout on sleep quality is significant. Chronic stress, which is the most important predictor of this phenomenon, can lead to insomnia (80). Continuous activation of the stress-related hypothalamic-pituitary-adrenal axis, associated with high levels of cortisol and other stress hormones, can trigger both burnout, depression, and insomnia (81,82). Insomnia was significantly associated with burnout in both univariate and multivariate analyses. Therefore, it is critical for managers to focus on preventing or detecting workplace burnout early, as this can improve workers' quality of life and sleep quality. Burnout can seriously damage an individual's mental and physical well-being, as well as negatively affect their personal relationships and social status (83,84).

5. COMPLEX EXAMINATION OF LOW BACK PAIN WITH NEUROPATHIC COMPONENT

The aim of our present work is to assess the incidence and neuropathic component of chronic low back pain, and to map the risk factors of neuropathic low back pain taking into account demographic factors, comorbidities and mental factors among those working in the logistics network of a large company participating in the study.

5.1. Methods

During the non-interventional cross-sectional examination, after providing preliminary information and the consent of the employee, paper-based questionnaires were distributed to the employees, and it was also possible to fill them out online.

The demographics taken into account in the study were: gender, age, marital status, number of children, education, years of work and second jobs.

We asked about the following comorbidities and risk factors: regular medication, smoking, alcohol consumption, drug use, diabetes, high blood pressure, cardiovascular disease, musculoskeletal disease, cancer and mental illness.

To detect neuropathic low back pain, we used the PainDetect (PD-Q) questionnaire, developed in 2006 to identify neuropathic pain in patients with chronic low back pain (90,91). It contains nine questions that deal with the quality of pain, the nature of pain, and how pain radiates. Between 0-12 points, neuropathic component is unlikely, between 13-18 points mixed pain is likely, above 19 points neuropathic pain is likely.

To detect mood disorders, the Beck depression abbreviated questionnaire was used, sleep disturbance was assessed using the Athens Insomnia Scale (AIS) (92,93,94,95). These test methods are described in Chapter 4.1.

Statistical analysis: The data were analyzed using descriptive statistics tools, T-test, $\chi 2$-test, correlation analysis and logistic regression analysis.

5.2. Results

Overall, 1034 questionnaire replies were returned by the end of the investigation period. 368 male (35.6%) and 666 female workers (64.4%) participated in the study. The age distribution of workers was as follows: 4% were aged 18-25, 13.3% were aged 26-35, 23.5% were aged 36-45, 43.9% were aged 46-55, 13.7% were aged 56-62 and 1.6% were over 62 years of age.

12.9% are single, 17.1% are in a relationship, 56.8% are married, and 13.2% are divorced or widowed. 22.8% are childless, the proportion of those with one and two children is 26 and 37.2%, respectively, and 13.9% have large families (≥3 children).

The proportion of career entrants is 4.5%, 1-5 years of employment is 20.3%, 6-10 years of employment is 10.3%, 11-20 years of employment is 17.5%, 21-30 years of employment is 25.6%,

31-40 years of employment is 19.9%, while the proportion of those who have worked for more than 40 years is 1.9%.

40% have their first job, 19% have their second, 17.7% have their third, 9.1% have their fourth, and 14.2% have at least their fifth job. 5.6% also have a second job.

43% are regular drug users, 28% smokers and 8.8% and 3.3% respectively. 29.5% suffer from hypertension, while the incidence of musculoskeletal disorders is 17.9%. It can be detected in 12% of cases of coronary heart disease (ischaemic heart disease) and 6% of cases of diabetes (diabetes).

36.2% of employees had no mood disorder based on the results of the questionnaire, 56.6% had mild, 6.2% had moderate depression and 10% had severe depression. According to the survey results, 17.9% of employees suffered from sleep disorders, a quarter of which turned out to be very serious. Chronic low back pain was detected in 8.8% of workers, of which 61% were mixed and 39% were neuropathic according to the results of the PainDetect questionnaire (Table 8).

Depression (%)	
no	36,2 (375/1034)
mild	56,6 (585/1034)
moderate to severe	6,2 (64/1034)
serious	1,0 (10/1034)
Trouble sleeping (%)	
no	77,5 (801/1034)
be	17,9 (185/1034)
serious	4,6 (48/1034)
Low back pain (%)	
no	91,1 (942/1034)
mixed	5,4 (56/1034)
Neuropathic	3,4 (36/1034)

Table 8. Depression, sleep disturbance and low back pain in the study population. (Source: author's own edit)

When analysing demographic data, people with one child (38.9% vs. 25.2%, p=0.044), 1-5 years old, 11-20 years old, and over 40 years of employment (27.8% vs. 20.1%, p=0.038, 30.6% vs. 17.7%, p=0.013, 8.3% vs 1.7%, p=0.046) and having a second job (13.9% vs. 5.0%, p=0.022) were found to be risk factors for neuropathic pain. In multivariate analysis, employment between 11 and 20 years (OR= 1.034, p=0.041), second job (OR=3.137, p=0.007), hypertension (OR=1.667, p=0.047), sleep disturbance (OR=9.808, p=0.002) and depression (OR=1.844, p=0.037) were found to be independent risk factors for neuropathic pain (Table 9).

N=1034 (%)	**No pain**	**Mixed pain**	**Neuropathic pain**	**p value**
Age				
18-25 years	3,8 (36/942)	3,6 (2/56)	8,3 (3/36)	0,237
26-35 years	14,0 (132/942)	7,1 (4/56)	5,6 (2/36)	0,319
36-45 years	23,7 (223/942)	17,9 (10/56)	27,8 (10/36)	0,268
46-55 years	43,3 (408/942)	51,8 (29/56)	47,2 (17/36)	0,207
56-62 years	13,5 (127/942)	19,6 (11/56)	11,1 (4/36)	0,236
≥ 62 years	1,7 (16/942)	0	0	0,128
Marital status				
unique	13,1 (123/942)	32,5 (7/56)	8,3 (3/36)	0,168
In relation to	16,3 (154/942)	25,0 (14/56)	25,0 (9/36)	0,171
married	57,9 (545 /942)	39,3 (22/56)	55,6 (20/36)	0,737
divorced/widowed	12,7 (119/942)	23,2 (13/56)	11,1 (4/36)	0,221
Number of children				
no	23,5 (222/942)	14,3 (8/56)	16,7 (6/36)	0,985
1 child	**25,2 (237/942)**	**32,1 (18/56)**	**38,9 (14/36)**	**0,044**
2 children	37,2 (350/942)	39,3 (22/56)	36,1 (13/36)	0,319
≥ 3 children	14,1 (133/942)	14,3 (8/56)	8,3 (3/36)	0,080
Employment				
1-12 months	4,6 (43/942)	3,6 (2/56)	0	0,780
1-5 years	**20,1 (189/942)**	**19,6 (11/56)**	**27,8 (10/36)**	**0,038**
6-10 years	10,9 (103/942)	0	11,1 (4/36)	0,892
11-20 years	**17,7 (167/942)**	**5,4 (3/56)**	**30,6 (11/36)**	**0,013**
21-30 years	25,8 (243/942)	26,7 (15/56)	19,4 (7/36)	0,472
31-40 years	19,2 (181/942)	42,9 (24/56)	2,8 (1/36)	0,483

≥ 40 years	**1,7 (16/942)**	**1,8 (1/56)**	**8,3 (3/36)**	**0,046**
Second job				
no	95,0 (895/942)	89,3 (50/56)	86,1 (31/36)	0,884
from	**5,0 (47/942)**	**10,7 (6/56)**	**13,9 (5/36)**	**0,022**

Table 9. Correlation of lower back pain types with studied demographics. (Source: author's own edit)

Among the risk factors and comorbidities examined, regular medication use (58.3% vs 41.6%, p=0.000), drug use (5.6% vs 3.2%, p=0.019), diabetes (13.9% vs 5.8%, p=0.003), hypertension (44.4% vs 28.2%, p=0.025), musculoskeletal pain (38.9% vs 15.8%, p=0.000), vascular disease (19.4% vs 4.6%, p<0.001), cancer (5.6% vs 1.9%, p=0.035) and previous spinal surgery (5.6% vs 1.4%, p=0.013) were identified as risk factors for neuropathic low back pain (Table 10).

Parameter tested (%)	**No pain**	**Mixed pain**	**Neuropathic pain**	**p value**
regular medication	**41,6 (392/942)**	**52,1 (32/56)**	**58,3 (21/36)**	**0,000**
smoking	28,1 (265/942)	37,5 (21/56)	36,1 (13/36)	0,173
alcohol consumption	8,4 (79/942)	12,5 (7/56)	13,9 (5/36)	0,064
drug use	**3,2 (30/942)**	**3,6 (2/56)**	**5,6 (2/36)**	**0,019**
diabetes	**5,8 (55/942)**	**3,6 (2/56)**	**13,9 (5/36)**	**0,003**
hypertension disease	**28,2 (266/942)**	**41,0 (23/56)**	**44,4 (16/36)**	**0,025**
coronary artery disease	**10,9 (103/942)**	**23,2 (13/56)**	**22,2 (8/36)**	**0,007**
musculoskeletal pain	**15,8 (149/942)**	**39,3 (22/56)**	**38,9 (14/36)**	**0,000**
stroke	1,6 (15/942)	1,8 (1/56)	5,6 (2/36)	0,140
vascular disease	**4,6 (43/942)**	**14,3 (8/56)**	**19,4 (7/36)**	**0,000**
cancer	**1,9 (18/942)**	**7,1 (4/56)**	**5,6 (2/36)**	**0,035**
depression	4,4 (41/942)	8,9 (5/56)	13,9 (5/36)	0,055
spinal surgery	**1,4 (13/942)**	**3,6 (2/56)**	**5,6 (2/36)**	**0,013**

Table 10. The relationship of risk factors and comorbidities with the type of lower back pain. (Source: author's own edit)

There was a strong association between neuropathic low back pain and moderate to severe depression (19.5% vs. 5.1%, p=0.000 and 13.9% vs. 0.5%, p=0.014) and the presence of sleep disturbance and severe sleep disturbance (33.3% vs. 16.6%, p=0.036, 30.6% vs 2.9%, p=0.009) (Table 11).

Parameter tested (%)	**No pain**	**Mixed pain**	**Neuropathic pain**	**p value**
Depression (%)				
no	37,7 (355/942)	14,3 (8/56)	33,3 (12/36)	0,366
mild	56,7 (534/942)	69,6 (39/56)	33,3 (12/36)	0,089
moderate to severe	**5,1 (48/942)**	**16,0 (9/56)**	**19,5 (7/36)**	**0,000**
serious	**0,5 (5/942)**	**0**	**13,9 (5/36)**	**0,004**
Trouble sleeping (%)				
no	80,5 (758/942)	53,6 (30/56)	36,1 (13/36)	0,069
be	**16,6 (156/942)**	**30,4 (17/56)**	**33,3 (12/36)**	**0,036**
serious	**2,9 (28/942)**	**16,0 (9/56)**	**30,6(11/36)**	**0,009**

Table 11. Relationship of depression and sleep disturbance to the type of lower back pain. (Source: author's own edit)

5.3. Discussion

Our study is one of the first studies that examines the incidence and complexity of neuropathic low back pain among Hungarian large corporate employees. The proportion of chronic low back pain was about 9% in our own study, which is roughly in line with the rates of previously published epidemiological studies (96). In about a third of workers with low back pain, the neuropathic origin of pain was clearly demonstrable (i.e. about 3% of all employees suffer from it), and the proportion of mixed pain (nociceptive + neuropathic) was also very high. This roughly corresponds to the proportions of previous data, where neuropathic origin was confirmed as a causative factor of nerve pain in 16-55% of lower back pains (85).

A family with one child, 1-5, 11-20 and more than 40 years of work, as well as taking on a second job proved to be factors related to neuropathic low back pain among the demographic parameters considered. A summary analysis of cross-sectional studies published on the topic concluded that low monthly income, joblessness and family circumstances may be closely related to

the development of nervous-related lower back complaints. This is partly similar to our results obtained among those who previously worked predominantly sedentary jobs (neuropathic low back pain was also the focus of the study), since the income of the workers participating in the study is typically at the bottom of the pay scale, and taking on a second job also assumes financial difficulties (97.98).

Moreover, among the above factors, employment between 11 and 20 years and taking on a second job were preserved in a multivariate analysis, which draws attention to the importance of working and financial conditions (85).

Neuropathic pain was also associated with hypertension, diabetes, a history of vascular disease and spinal surgery (98,99). The link between hypertension, cardiovascular disease and the development of neuropathic pain has long been known, and the association with diabetes as one of the most common factors leading to neuropathic pain is also not surprising (100,114,115). The relationship with mood disorder has also been known for a long time. However, interestingly, previous spinal surgery also proved to be a risk factor, which underlines the importance of proper patient examination and risk assessment, and the importance of neurosurgical interventions strictly following guidelines.

Hypertension also retained its role as a predictive factor in multivariate analysis. Neuropathic pain due to injury or inadequate function (malfunction) of the somatosensory system causes various central nervous system abnormalities in the activity of areas involved in pain processing and emotional charge, which may lead to an increase in the activity of the autonomic nervous system, among others, (85,101). What has been described above may explain the relationship between these two phenomena.

Sleep and mood disturbances have also been shown to be independent predictive factors. The prevention and treatment of depression is of paramount importance, and according to the World Health Organization (WHO), due to constant pressure to perform and overstrain at work, depression will become the leading disease by 2030, and the resulting 'suicidum' will also be one of the leading causes of death (85,102). The importance of this topic is highlighted by the high incidence of at least moderate depression in the study group.

It should be mentioned that our study also has limitations. Through cross-sectional testing, although the number of cases is very high, the sample is far from representative, so the conclusions reached apply only to the specific study group and not to the profession as a whole. Due to the non-interventional questionnaire examination, no detailed medical examination and condition assessment was carried out, i.e. neither the exact history nor the current drug treatment was known, and no

follow-up survey was carried out. The aforementioned facts can presumably significantly influence our results, so their interpretation requires caution.

6. COMPLEX ASSESSMENT OF THE USE OF ERGONOMIC AIDS AMONG WORKERS SUFFERING FROM CHRONIC LOW BACK PAIN

Chronic pain is an independent pathology beyond the temporality of pain, which is associated with neuroplastic lesions of the nervous system; Biological, psychological and social factors all play a role in its formation and maintenance. A neuropathic component can be detected in a significant proportion of chronic low back pain, even more than half, which does not respond or responds very little to conventional treatment (104).

The aim of our study is to assess from a medical point of view the effectiveness of the so-called ergonomic aids often used among workers suffering from this disease, which can cause a reduction in load and thus an improvement in pain sensation by facilitating the movements of the spine and preventing forced postures. During our 3-month follow-up pilot study, in addition to assessing demographic data and comorbidities, pain and its mental consequences were objectively assessed using validated questionnaires.

6.1. Methods

Of the employees, 108 employees suffering from chronic low back pain were selected partly on the basis of recruitment and partly on the opinion of the expert staff, of which 54 were in the control group and 54 people were equipped with ergonomic aids.

In addition to demographic data and the recording of comorbidities, questionnaires on depression, sleep disorders, decreased function, pain and burnout are carried out. After 3-month cycle phases, repeated surveys were carried out in the project to assess the change.

The demographics taken into account in the study were: gender, age, marital status, number of children, education, years of work and second jobs.

We asked about the following comorbidities and risk factors: regular medication, smoking, alcohol consumption, drug use, diabetes, high blood pressure, cardiovascular disease, musculoskeletal disease, cancer and mental illness.

The PainDetect (PD-Q) questionnaire was used to detect neuropathic low back pain, and the Beck depression abbreviated questionnaire was used to detect mood disorders. Sleep disturbance was assessed using the Athens Insomnia Scale (AIS) and burnout was measured using an abbreviated

version of the Mini-Oldenburg Burnout Inventory (MOLBI) (340,341). These test methods are described in Chapter 10.1.

6.2. Statistical analysis

The data were analyzed using the tools of descriptive statistics, T-test, $\chi 2$-test, correlation analysis.

6.3. Results

A total of 108 employees participated in the study, two employees did not participate during the study, so their data is not included in the processing. Thus, data from a total of 106 patients were processed, 49 men and 57 women (mean age 45.6 years ± 9.86 years). 24 workers are single (23.1%), 17 are in a relationship (16.3%), 52 are married (50%) and 11 are divorced or widowed (10.5%). 30 workers have no children (28.3%), 33 (31.1%) and 28 (26.4%) with 1 or 2 children, respectively, and the rest of the workers have 3 or more children (14%). 89 workers had secondary education (85.6%) and 15 had tertiary education (14.4%). 1 worker was considered a career entrant (0.9%), 2 employees were 1-5 years old (1.8%), 25 employees were 6-10 years old (23.6%), 9 workers (8.5%) were 11-20 years old, 31 workers were 21-30 years old (29.2%), 20 workers were 31-40 years old (18.9%) and 17 workers were over 40 years old (16%). 3.7% have a second job. 38.7% take medication regularly, 26.4% smoke regularly. 7.5% drink alcohol more or less regularly and 4.7% have used drugs. Diabetes occurs in 8.5% of patients and 23.6% of workers are hypertensive. Cardiovascular disease was reported by 5.7% of workers, cerebrovascular disease (stroke) by 0.9%. Musculoskeletal disorders were reported in 11.3% of workers, and the incidence rate of depression was 3.8%.

For the entire study population, the mean score for depression at baseline was 10.9, which was 10.5 after 3 months ($p=0.14$). No significant statistical difference was detected in the case of improvement of sleep disorders in the overall population (3.15 vs. 2.76 points, $p=0.2$). There was no improvement in mobility (3.8 vs. 3.3 points, $p=0.1$) or in average pain scores (10.97 vs. 10.87 points, $p=0.9$). However, there was a significant improvement in subjective quality of life (79.2 vs. 84.7 points, $p<0.001$), although burnout scores did not change significantly (2.44 vs. 2.36, $p=0.19$).

For the control group, the study parameters were as follows: at baseline, the mean score for depression was 10.3, which changed to 10.13 points after 3 months ($p=0.52$). No significant statistical difference was detected in the case of improvement in sleep disorder in the overall population (2.5 vs. 2.31 points, $p=0.62$). There was no improvement in mobility (2.87 vs. 2.33 points, $p=0.26$) or average pain scores (7.89 vs. 7.5 points, $p=0.69$). However, there were significant

improvements in subjective quality of life (83.4 vs 88.54 points, p<0.001, and 2.53 vs. 2.2 points, p < 0.001), although burnout scores did not change significantly (2.4 vs. 2.5, p=0.11).

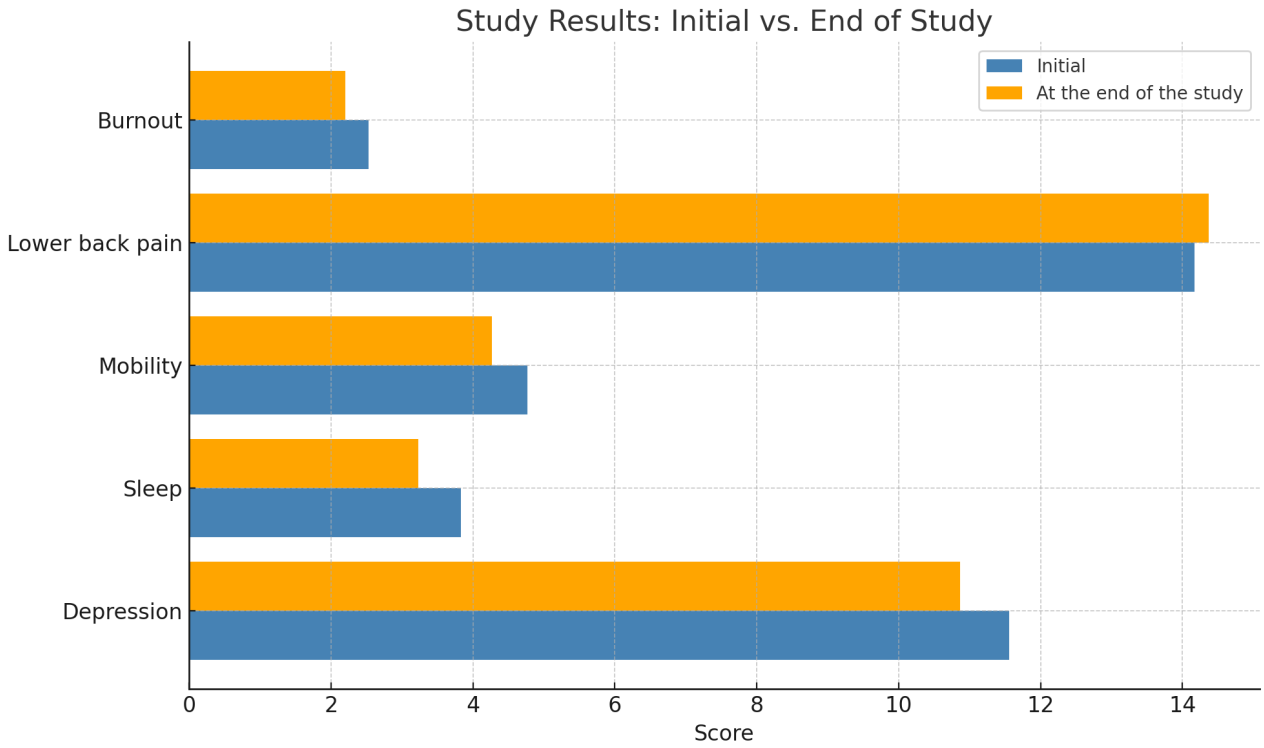

Figure 5. Test parameters at start and end of study in the entire study population (Source: author's own edit)

For the study group, the following results were obtained: at the start of the study, the mean score for depression was 11.56, which changed to 10.87 points after 3 months (p=0.19). Sleep disturbance showed significant improvement by the end of treatment (3.83 vs. 3.23 points, p=0.02). There was no improvement in mobility (4.77 vs 4.27 points, p=0.4) or average pain scores (14.17 vs. 14.37 points, p=0.9). However, there were also significant improvements in both subjective quality of life and burnout (83.4 vs 88.54 points, p<0.001, and 2.53 vs. 2.2 points, p < 0.001) (Figure 5).

5 patients in the treatment group received seat cushions. At baseline, the mean score for depression was 9.6, which changed to 9.2 after 3 months (p=0.47). Sleep quality scores changed from 2.8 to 1.8 (p=0.39). In mobility, its overall scores were 4 and 3 respectively (p=0.18). The mean pain score increased from 4.6 to 14.6 (p=0.002). The burnout score changed from 2.46 to 2.76 (p=0.33). Quality of life was initially 74.2 points, then 80.9 points (p=0.28) (Figure 6). Due to the low number of cases, any interpretation should be received with reservations.

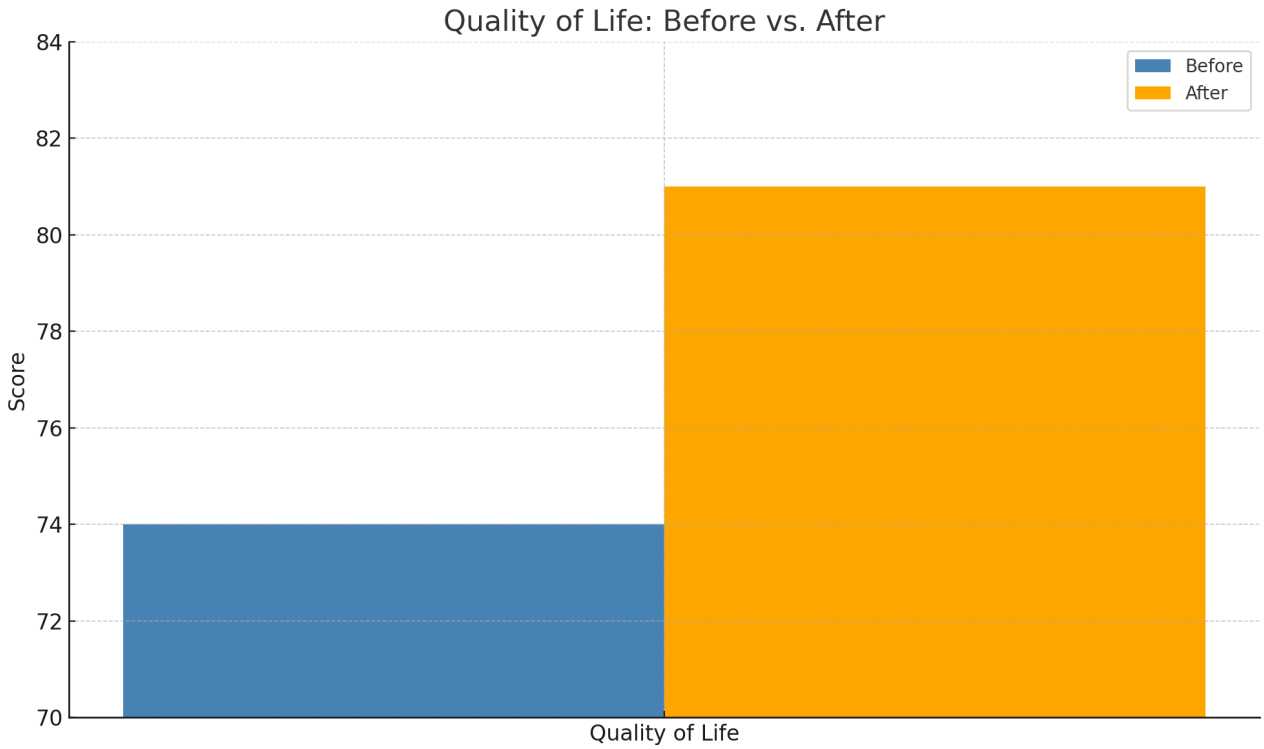

Figure 6. Change in quality of life during the study in the group using the device. (Source: author's own edit)

Lumbar support was used by 10 workers. At the start of the study, the mean score for depression was 10.1, which changed to 10.2 points after 3 months (p=0.42). His sleep quality scores changed from 2.5 to 2.3 (p=0.37). In mobility, its overall scores were 2.3 and 2.5 respectively (p=0.39). The mean pain score decreased from 10.7 points to 9.4 (p=0.33). The burnout score changed from 2.59 to 2.51 (p=0.16). Quality of life was initially 87.5 points, then 91 points (p=0.1). Due to the low number of cases, any interpretation should be received with reservations.

Waist support belts were used by 37 workers. At the start of the study, the mean score for depression was 12.22, which changed to 11.27 after 3 months (p=0.1). Sleep quality scores changed from 4.32 to 3.68 (p=0.39). In mobility, its overall scores were 5.54 and 4.92 respectively (p=0.21). The mean pain score changed from 16.41 to 15.68 (p=0.35). Burnout scores decreased significantly from 2.48 to 2.28, and quality of life improved significantly (70.6 vs. 76.9 points, p=0.01 in both cases).

6.4. Discussion

Our pilot study shows how significant the role of psychosocial fators in the treatment of chronic low back pain is in addition to medication. Considering the workers surveyed as a whole, the mere

fact that their complaints were addressed within the framework of the study and solutions were proposed resulted in an improvement in subjective quality of life in both groups, which highlights the importance of a supportive atmosphere, which cannot be emphasized enough (109).

The study of the control group also confirmed an improvement in quality of life, although in their case no ergonomic aids were used, they still – in common parlance – "felt better in their skin" simply by conducting a health check. This underscores the importance of placebo in managing chronic pain. Both placebo and nocebo effects (when no meaningful intervention is performed in the patient, but worsening is detected) have signaling pathway activation based on functional MRI examinations, so their effect is of paramount importance from the point of view of meaningful pain therapy (110).

In the study (active) group, in addition to the improvement in quality of life, sleep quality improved significantly, and the mean burnout score also decreased statistically significantly. This also confirms the importance of a supportive work environment and periodic requests for opinions from employees, since – purely from a medical point of view – no significant improvement has occurred, and psychosocial factors can be clearly detected behind the above positive results. The role of a supportive atmosphere is important to avoid both burnout at work and other physical and mental complications (111,112,113).

The positive result also confirms that not only pharmacological, but also non-pharmacological/physiotherapeutic interventions are considered in the treatment of chronic low back pain, as the literature suggests, although the medical literature on ergonomic waist aids is poor, our present study is among the first, especially considering its complexity. Due to the low number of cases, it is difficult to comment on the subgroups, we can only give our impressions about the use of seat cushions and lumbar support, which showed no clear positives. It was the use of the waist belt that can best be attributed to the positive results of the study, where verbal feedback was also favorable and the number of cases was sufficient to carry out a proper qualitative analysis.

7. CONCLUSION

In this section, I summarize the new scientific results of my dissertation in relation to the three areas set out in the Objectives.

7.1. Complex study of burnout among large corporate employees

The aim of my research among postal workers was to examine the phenomenon of burnout in detail and to explore its various connections. In our study, the incidence of total burnout was 50.8%, which is a surprisingly high rate, especially considering that healthcare professionals are generally considered to be the most vulnerable. Data shows that mail carriers, like healthcare workers, are often overwhelmed, which may explain high burnout rates in this population.

My research has shown that the female sex independently of other factors has a significant impact on the development of burnout. Thus, the female gender alone contributes significantly to the risk of burnout, without taking into account other demographic or workplace factors, since women are usually responsible for most of the housework and childrearing in addition to work, so they become emotionally exhausted faster.

Eurostat results confirm that women spend more time on domestic and family care activities in almost all Member States of the European Union. The results of the research also confirmed that the degree of burnout is significant even among career starters. Graduates are less experienced, lack routine in the job and find it harder to cope with increasing stress. In addition, those who have worked for more than 30 years also experienced a significant increase in burnout.

Smoking emerged as a protective factor against burnout in the research, which is controversial compared to previous findings. It is assumed that smoking functions as a kind of stress management method for those who are close to burnout but have not yet completely burned out.

Musculoskeletal pain was significantly associated with burnout in both univariate and multivariate analysis. Workers often adopt incorrect postures, which increases physical and mental exhaustion, as well as the production of cortisol, which affects muscles. The incidence of depression was significantly higher among those who experienced burnout.

The study showed an increase in the incidence of moderate to severe depression among these patients, and that depression severity was closely related to burnout severity. The relationship between depression and burnout remains a matter of debate, but the results show that the presence of depression did not show a significant association with burnout.

Burnout also had a significant impact on sleep quality. Chronic stress can lead to insomnia because constant activation of the hypothalamic-pituitary-adrenal axis is associated with high levels of cortisol and other stress hormones. Insomnia was significantly associated with burnout, so it would be important for managers to prevent or recognize workplace burnout in order to improve workers' quality of life and sleep quality.

My research has significantly contributed to our understanding of burnout among corporate workers. The results highlighted that burnout is a complex phenomenon influenced by a number of demographic, occupational and psychological factors.

7.2. Investigation of the relationship between burnout and neuropathic low back pain

The aim of my research was to investigate in detail the relationship between burnout and neuropathic low back pain, especially in jobs where nociceptive, mixed or neuropathic pain types are common. The study has produced a number of new scientific findings that may contribute to a deeper understanding of neuropathic low back pain and burnout, as well as improvements in prevention and treatment methods.

The proportion of chronic low back pain in the study was about 9%, which is roughly in line with previously published epidemiological studies. In about a third of workers with low back pain, the neuropathic origin of pain was clearly demonstrated, affecting about 3% of all workers. The proportion of mixed pain (nociceptive + neuropathic) was also very high, which is in line with previous data, according to which neuropathic origin was confirmed in 16-55% of lower back pains.

A family with one child, 1-5, 11-20 or more than 40 years of work, and having a second job were found to be factors associated with neuropathic low back pain. Employment between 11 and 20 years and taking on a second job also retained their predictive value in multivariate analysis, which highlights the importance of working and financial conditions.

Neuropathic pain was associated with hypertension, diabetes, a history of vascular disease and previous spinal surgeries. The link between hypertension and neuropathic pain has long been known, while diabetes is among the factors leading to the most common neuropathic pain. Interestingly, previous spinal surgeries have also proven to be a risk factor, which underlines the importance of proper patient examination and risk assessment. Mood disorders and sleep disorders have also been shown to be independent predictive factors.

The relationship between depression and burnout is close, and preventing and treating depression is paramount. According to the World Health Organization (WHO), depression will be the leading disease by 2030 and the resulting mortality (suicide) will be among the leading causes of death. In our research, the high incidence of at least moderate depression also draws attention to the severity of the problem.

Our study is one of the first studies that examines the incidence and complexity of neuropathic low back pain among Hungarian large corporate employees. One of the limitations of our study is that although the number of cases is high through cross-sectional examination, the sample is not

representative. As a non-interventional questionnaire study, no detailed medical examination and condition assessment were performed, so neither the exact history nor the current drug treatment was known, and no follow-up survey was carried out. These limitations can affect the interpretation of the results and should be taken into account with caution. My research has significantly contributed to understanding the relationship between burnout and neuropathic low back pain. The findings revealed that burnout and neuropathic pain are associated with a number of demographic, occupational and psychological factors.

7.3. Complex assessment of the use of ergonomic aids among workers suffering from chronic low back pain

The aim of the research was to assess in detail the effectiveness of ergonomic aids among workers suffering from chronic low back pain. The purpose of the aids is to support spinal movements and prevent forced postures, thus reducing physical exertion and pain sensation during work. Another goal was to explore the role of psychosocial factors in the development of pain, and to investigate the placebo effect in the therapeutic application of ergonomic aids.

During my research, I compared the effectiveness of various ergonomic aids, with special regard to maintaining and improving the working capacity of older manual workers. The study revealed that psychosocial factors play a significant role in the treatment of chronic low back pain. The very fact that we dealt with workers' complaints and proposed solutions resulted in an improvement in subjective quality of life in both groups. This highlights that a supportive atmosphere is paramount in managing chronic pain.

In the control group, where no ergonomic aids were used, quality of life also improved, which supports the significance of the placebo effect. In the active group, where ergonomic aids were used, in addition to improving quality of life, sleep quality improved significantly, and the average burnout score decreased statistically significantly. This underlines once again the importance of a supportive work environment and periodic consultation of employees. Psychosocial factors can be clearly identified behind the positive results, since there was no significant improvement from a medical point of view.

Our results show that not only pharmacological, but also non-pharmacological and physiotherapeutic interventions can be effective in the treatment of chronic low back pain. The medical literature on ergonomic aids is currently poor, but my research is one of the first to examine their effectiveness in a complex way. Due to the low number of cases, it is difficult to make a meaningful statement about the subgroups, but it can be concluded that the use of seat cushions and

lumbar support did not show clear positive results. In contrast, the use of the waist belt brought favorable feedback and positive results, which was satisfactory for the analysis.

It is important to note that the limitations of my study were low case counts and an unrepresentative sample. Through the non-interventional questionnaire examination, no detailed medical examination and condition recording were carried out, so the exact history and current medication were not known. There was also no follow-up survey, which may affect the interpretation of the results.

My research contributed to a deeper understanding of the effectiveness and applicability of ergonomic aids among workers suffering from chronic low back pain. The results show that psychosocial factors, supportive work environments and placebo effects play a significant role in the management of chronic pain.

8. ACKNOWLEDGMENTS

I would like to express my gratitude to Dr. Gergely Fehér, who was not only my supervisor, but also my mentor during this period. I thank him for the opportunity to explore these topics and for accompanying me throughout my journey, helping me with productive advice and reliable guidance.

Furthermore, I would like to express my gratitude to Prof. Dr. László Szapáry and Prof. Dr. József Janszky, head of the doctoral school, who made it possible to realize my ideas and enriched my manuscripts with supported time and energy, as well as valuable advice.

I do not forget Dr. Antal Tibold, who not only helped me during my doctoral studies, but also set an example for me.

I am grateful to my family for all the support that has enabled me to start and finish my doctoral studies. Special thanks go to my wife, Alice, who has been supportive of me, even at times when work has come first.

I don't forget my fellow researchers who helped and supported me in this research.

Last but not least, my thanks go to the management of the large company, especially the Trade Union staff and its leaders, and to Madam President.

9. PUBLICATIONS

9.1. Publications closely related to the thesis

1. Kovács M, Muity G, Szapáry Á, Nemeskéri Z, Váradi I, Kapus K, Tibold A, Zalayné NM, Horvath L, Fehér G. The prevalence and risk factors of burnout and its association with mental issues and quality of life among Hungarian postal workers: a cross-sectional study. BMC Public Health. 2023; 23(1):75. https://doi.org/10.1186/s12889-023-15002-5.
   IF: 3,500 (Q1)

2. Kovács M, Nemeskéri Z, Tibold A, Vámosi T, Fehér G. Complex assessment of the effectiveness of ergonomic aids among workers with chronic low back pain: pilot study. Medicus Universalis. 2022; 55(5):205-209.

3. Kovács M, Nemeskéri Z, Tibold A, Vámosi T, Fehér G. Complex assessment of neuropathic component low back pain among large enterprise workers. Medicus Universalis. 2022; 55(4):151-156.

4. Kovács M, Nemeskéri Z, Vámosi T. Determinants of work capacity in the logistics field of a given large enterprise (Part I). New Labour Review. 2022; 3(3):39-53.

5. Kovács M, Nemeskéri Z, Vámosi T. Determinants of work capacity in the logistics area of a given large enterprise (Part II). New Labour Review. 2022; 3(4):2-22. https://doi.org/10.58269/UMSZ.2022.4.1.

9.2. Other publications

1. Nemeskéri Z, White G, Vámosi T, Kovacs M, Zalay NM. The future of work in postal services: pilot programme experiences. In: Dévényiné RE, Tibold A, eds. ErgoScope: Theoretical issues and good practices of objective assessment of working ability. Pécs, Hungary: University of Pécs; 2023:183-203.

2. Vámosi T, Nemeskéri Z, Ladányi E, Kovács M. Competence-based approach. In: Dévényiné RE, Tibold A, eds. ErgoScope: Theoretical issues and good practices of objective assessment of working ability. Pécs, Hungary: University of Pécs; 2023:66-76.

3. Kósa G, Feher G, Horvath L, Zadori I, Nemeskéri Z, Kovacs M, Fejes É, Meszaros J, Banko Z, Tibold A. Prevalence and Risk Factors of Problematic Internet Use among Hungarian Adult Recreational Esports Players. International Journal of Environmental Research and Public Health. 2022; 19(6):3204. https://doi.org/10.3390/ijerph19063204.
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4. Szapáry Á, Fehér A, Kovács M, Fejes E, Kapus K, Bankó Z, Tibold A, Fehér G. Study of Internet addiction, sleep disorder, depression, burnout and quality of life among secondary school teachers: correlation analysis model. BEHOLD. 2022; 21(4):49-56. https://doi.org/10.53020/IME-2022-406.

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   IF: 0.600 (Q4)

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