New Challenges and Opportunities in Occupational Health in the Examination of Work Ability

Doctoral (PhD) Dissertation –

Theses

Marietta POHL

University of Pécs, Faculty of General Medicine

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Marietta POHL

University of Pécs
Faculty of General Medicine
Graduate School of Clinical Medicine

Head of Graduate School of Clinical Medicine:
Prof. Dr. Lajos BOGÁR

Program Manager: Prof. Dr. Kálmán TÓTH

Doctoral Supervisor: Dr. Antal TIBOLD

Centre for Occupational Health and Work Hygiene

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1. Introduction

In my doctoral dissertation, as shown by the title, I undertake to investigate areas that focus on the occupational health-related challenges associated with current socioeconomic and labour market problems and fit into the research profile of the Centre of Excellence for Work Sciences and Occupational Health of the Clinical Centre of the University of Pécs (hereinafter as "PTE KK"), an entity recently established under the leadership of my doctoral supervisor.

My research covers three subtopics; all the analyses contained in my doctoral dissertation were published in Hungarian or foreign peer-reviewed journals with an impact factor. These three subtopics are as follows:

(1) validation of the use of a computer-based ability assessment tool developed by Hungarians (named ErgoScope),

(2) measuring the physical and mental competencies of employees over 45 years of age living in the Ormánság [a geographical area in South-West Hungary],

(3) a prospective cross-sectional study of Internet addiction measured in 14 educational facilities in Hungary.

Accordingly, this doctoral dissertation is structured so that all thematic chapters contain an analysis of the three subtopics above.

1.1 Determining work ability

Work and being able to work is an important factor in an individual's life. Work gives a sense of identity, plays a social role, and is a very important part of a person's identity.

Unemployment (whether due to losing one's job or other limitations) clearly has adverse social and health consequences (1, 2).

The task of occupational health specialists is, primarily, to choose a job that best suits an employee's physical/psychological/social condition; secondly, to do everything possible to ensure that the individual maintains their physical/psychological/social condition in the specific work environment; thirdly, to filter out factors potentially dangerous to health and develop corresponding defence strategies; and fourthly, to facilitate the return to work after the onset of various diseases, and to choose a job suitable for the patient's condition (2, 3).

Examination of work ability and the methods used for determining it have (unfortunately) not been integrated into general medical practice. They are not a substantial

part of medical training either, as the latter mainly focuses on the mechanisms of the formation of diseases and the treatment of symptoms (2).

Work ability has both medical and legal definitions. Unfortunately, to this day, there is no clear and standardised medical definition to assess work ability neither in Hungary, nor internationally (2, 4).

1.2 Labor market situation in the Ormánság

The second main area of my research was the empirical processing of the data derived from a practical project aimed at the assessment of work ability. My experiences on which the research was based were also supported by literature data in terms of the two major and most urgent problems of the Hungarian countryside, namely the loss of population and the difficult situation of the population living in extreme poverty.

It was first assumed only in the last decade of the 20th century that unemployment is associated with impaired physical health, and it was accepted as a fact only in the first decade of the 21st century. A study published by the Hungarian Statistical Office (KSH) in 2009 comments on this matter as follows: "While two decades ago," (i.e. around the change of regime in Hungary) "when researching the links between social inequalities and health status, it was necessary to argue that unemployment – and more broadly, non-employment – should be included among the dimensions of social inequalities, while in the first decade of the 21st century the school of thought that deals with the relationship between job insecurity and health status became one of the significant branches of health sociology". In an editorial published in 2009, the British Medical Journal also deals with the adverse health effects of unemployment and states that, according to research conducted in the early 1990s, unemployment increases mortality, and that those who get a job after unemployment recover faster from their illnesses (60).

In addition to the high proportion of long-term jobseekers, poorly educated people and people with outdated skills and qualifications, the effects of various national trends also manifest themselves in the Ormánság region. With the increase in life expectancy at birth and the rising proportion of elderly people in society, it has become extremely important that aging workers stay active. The continuous delay of the retirement age and the care of older generations place a heavy burden on employees over 45 years of age. Poor health further reduces work ability, hurting the chances of the target group members. Those jobseekers who

do not have access to the necessary health screenings are in a particularly difficult situation (5).

Eszter Barakonyi also highlights in her study that, as a result of raising the age of retirement and the challenges posed by an aging society, the proportion of aging workers in the labour market is expected to increase. The author underlines that the situation of women over 55 is more vulnerable than that of men of a similar age. In many cases, the burden of caring for relatives and of tasks related to grandchildren fall on women. Besides the additional workload, the health status of employees is not favourable either, as a gradual decrease in physical capacity can be observed after reaching the age of 50. Between 2010 and 2018, whilst unemployment decreased, an increase in the number of jobseekers over 50 was observed, which also draws attention to the importance of the issue of aging workers (66).

The author stresses that an aging society can pose a threat to the sustainability of the economy and the pension system. However, the problem cannot be remedied solely by continuously raising the age of retirement. A preventive approach is indispensable, i.e. preparing young and aging workers for longer activity in the labour market, one of the steps of which is to improve health and increase health literacy (5). Work ability and its preservation are a key issue from a socioeconomic point of view. Eszter Barakonyi highlights that her experience has shown that the willingness to work is particularly high among members of the examined group, however, this alone is not enough without creating the necessary working environment and framework (i.e. labour market security) (66).

1.3 Internet addiction

In conjunction with the research portfolio of the Centre of Excellence for Work Sciences and Occupational Health of PTE KK, the third occupational health area examined in my doctoral dissertation is Internet addiction, which, based on a study conducted by our research group, is a new risk factor in the 21st century which is fundamental in the interpretation of suitability to work (132).

In the last decade, the explosive growth of Internet use and the widespread availability of fast Internet connection have fundamentally changed the population's lifestyle, media usage habits and time structure. While allowing wider access to information, this phenomenon has also had several negative implications: "*out-of-control Internet use that*

completely transforms the lifestyle of a person is considered a new syndrome among addictions" (71).

The recognition of Internet addiction is hampered by the fact that it is a socially accepted technological achievement used in everyday life, and therefore it is difficult to notice when someone close to us becomes addicted, as usually neither the person suffering from addiction nor their environment recognises the behavioural problem (67, 72).

This phenomenon is still the subject of intense research and debate, and several terms have appeared over the years to describe/name it. It is also not entirely clear whether problematic Internet use is a separate phenomenon or a group of symptoms overlapping with addictions and anxiety/mood disorders? The set of criteria to be used for this phenomenon is also unclear. One of the two most widespread approaches is the addictological interpretation, which defines Internet addiction as a behavioural addiction or impulse control disorder, while the other main approach is the cognitive-behavioural model, which primarily emphasises the pathological cognitive and behavioural characteristics of the phenomenon (72-75). In any case, it can be established that if someone spends a significant proportion of their lives on the Web and/or continuously thinks / daydreams about surfing the Internet, which – similar to other addictions – is detrimental to their personal relationships, school and work performance, and takes up most of their leisure time, this can be considered Internet addiction (67, 70, 72, 76).

Based on the latest summary analyses, 7–10% of the population could potentially be affected by Internet addiction, and this could reach or exceed 20% among those under the age of 25 (71, 75). This is a major issue in Hungary: Gemius and Ipsos research and investigations undertaken by the Central Statistical Office show that the number of regular Internet users has almost doubled in five years, and the time Hungarians spend on the Internet has increased eightfold, suggesting that Internet addiction may become more frequent in the future (76). Young people (under 25 years of age) are the most likely to be affected, as the heaviest Internet use is in adolescence (and increasingly in childhood) (77). Much less data are available on the internet habits of adults, especially the middle-aged and elderly population, and its consequences, even though the above changes have also deeply affected them (67).

2. Objectives

In line with the structure of this doctoral dissertation, the objectives were also defined in accordance with the three major research topics.

I. Regarding the first topic, in conjunction with a project implemented by the Centre of Excellence for Work Sciences and Occupational Health of PTE KK, **the objective of our work was to present ErgoScope, a system developed in Hungary for the assessment of work ability and used as part of complex health assessments, as well as to describe and validate a methodology developed by us, which is easy to use in everyday life.** The research was carried out within the framework of the EFOP-3.6.1-16-2016-000048 project, in connection with implementation of the subtopic "Development of a methodology for the joint examination and assessment of physical and mental competences to promote the employment of aging workers".

II. Based on the methodology developed and validated for subtopic 1, in the second round of investigation, within the framework of project number GINOP-5.3.5-18-2019-00105, **our objective was to measure the physical and mental competences of employees over 45 years of age living in the Ormánság, and to examine their suitability for work.** Approximately 1,200 people over 45 years of age live in the target area of the project, namely in the 43 settlements falling within the scope of the Ős-Dráva [Ancient Drava River] Project, primarily in Baranya County and in some settlements in Somogy County. When the grant proposal was submitted, the proportion of aging workers among registered jobseekers exceeded 20%. The project created an opportunity to start a pilot program, and to test and further improve the developed methodology. During the project period, it was possible to assess 50 people's work ability, and 250 target group members participated in a program designed to help them adapt to the labour market. **Accordingly, the objective of the study was to present research results that provide adequate information for employers and providers engaged in labour market services in the target area.**

III. Thirdly, in the context of problematic Internet use, the objective of our study was to analyse **risk factors** (including detailed demographic data, substance use and abuse, most common medical conditions) **and the role of certain mental problems,**

physical health parameters, as well as to determine independent parameters related to the phenomena.

3. Validation of the use of a computer-based ability assessment tool developed by Hungarians (ErgoScope)

Out of the two key players in the labour market, employers have a vested interest in having adequately qualified and healthy workforce at their disposal by ensuring appropriate work environment and assigning them suitable tasks. It is in the employees' interest, too, to be well-informed about their occupation, work as well as the circumstances and health conditions thereof. Consequently, these important actors in the world of work need information (109). HR managers and generalists, recruitment agents, job placement consultants, occupational psychologists, and occupational health practitioners are also interested parties. The methodology of combined examination and assessment of physical and mental competences reflects a holistic approach typical of European work philosophies, i.e. *it examines a person's entire set of competences* while also considering the context. In the current structure, such a complex examination of working skills is a novelty in itself (110).

Objective tests are an important component of assessing work ability, the well-thought-out use of which can provide important data. In the practice of occupational psychology and occupational health, several interdependent methodologies that build on each other are used for the collection of information, including questionnaires and computer tests. Use of the *ErgoScope work simulator* is a new possibility that could introduce a methodology supported by objective and validated data measurements into the process of determining work ability (48).

This system is suitable for facilitating work organisation, staff selection and job-sharing. In the world of work, the ability to bear workload and human performance are determined not only by physical factors, but rather by a combination of physical and psychological factors (111). The joint examination of physical and mental competences is considered a novelty even at an international level with significant potential for innovation. Furthermore, complex examinations and assessments provide an opportunity to identify health and occupational risk factors and to psychometrically determine an individual's status (48).

3.1 Methods and study subjects

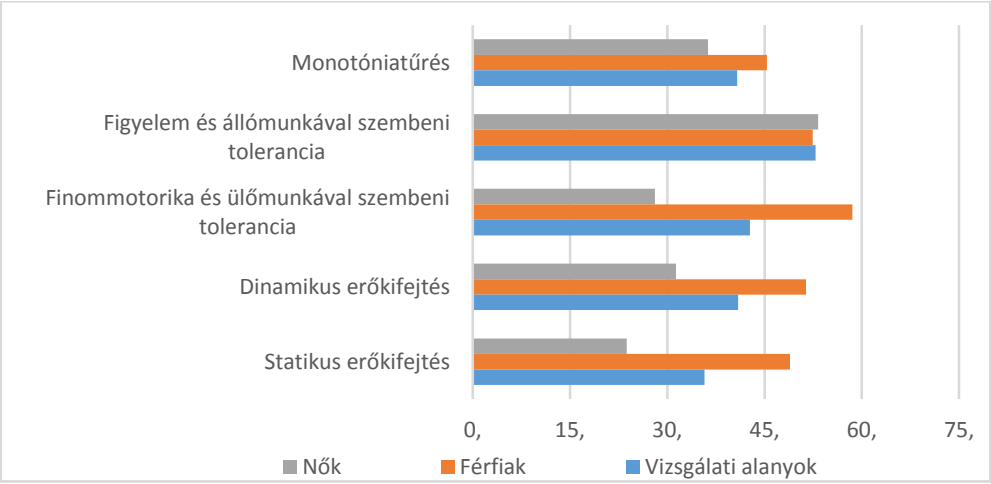
The purpose of the research presented in the publication entitled *Practical Use of the ErgoScope System* was to develop and test a protocol for making medical findings that enables the creation of comprehensive, clear, structured medical records/findings and shorter, targeted examinations. In the first round, instead of 20 measurement results, 5 large categories were created, which included the following: 1. static effort, 2. dynamic effort, 3. fine motor movements and tolerance for sedentary work, 4. attention and tolerance to standing work, 5. tolerance for monotony (50).

In 2018-2019, a total of 208 subjects performing intellectual / sedentary work were tested (average age: 47.5 ± 12.3 years). The measurement results of 109 (average age: 48.3 ± 11.6 years) female and 99 (average age: 46.5 ± 12.9 years) male subjects were processed. According to the old method for making medical findings, 4,160 measurements were to be carried out, while using the new categories, only 1,040 piece of measurement data are required, which can be stored and processed much more easily.

3.2 Results

Compared to the normal value specified by the manufacturer [of ErgoScope], the examined population achieved a result of 35.75% in static effort, 40.9% in dynamic effort, 42.74% in fine motor movements, 52.9% in concentration, and 40.7% in tolerance for monotony (Fig. 1) (50).

Figure 1: Test parameters and their distribution by gender (50)



The performance of men in terms of static and dynamic effort and fine motor movements exceeded that of women [$p<0.001$ in all cases], but there was no difference in terms of tolerance for monotony and concentration. With age, tolerance for monotony decreased significantly, and the exertion of dynamic and static effort and fine motor movements were closely correlated with each other (50).

3.3 Discussion

Our work aimed at establishing a protocol to support the testing of the Hungarian-developed ErgoScope system and to promote the uptake thereof. Instead of a complicated way of making medical findings which requires about 20 measurements, an innovative, structured assessment system including 5 large categories has been created with simple and easily understandable explanations.

It can be stated that all machines/software designed for skills testing enable a very detailed and objective assessment of the range of motion and the limits of physical strength, however, each test can take up to 3 hours, which is very burdensome for the subject, and it is not absolutely necessary to implement the entire protocol in every case (114). Static and dynamic effort, as well as the ability to coordinate them, can be objectively measured using different sets of tasks. Stamina assessment is also part of the protocol. In addition, the execution of various fine motor movements, the suitability for sedentary and standing work, and tolerance for monotony are also assessed (2, 115). Somewhat surprisingly, the subjects in the examined population – most of whom are middle-aged – were able to achieve about half of the specified normal values during the study. The explanation for this can be twofold: on the one hand, they simply got tired during the long examination, and on the other hand, the specified values may be average values obtained from the examination of individuals with above average working ability. This draws attention to the need to provide detailed information to subjects (long testing time); on the other hand, it justifies the introduction of abridged protocols appropriate to the job (50). There were fundamental differences between the motor skills performance of men and women, which can be explained by the different biological makeup and muscle structure. Interestingly, there was no significant difference in concentration and tolerance for monotony, but both groups performed far below the specified average. However, tolerance for monotony decreased significantly with age, which draws

attention to the need for periodic status assessment of workers in monotonous jobs (e.g. production line work) (50).

4. Measuring physical and mental competencies among employees over 45 years of age living in the Ormánság [a geographical area in South-West Hungary]

During the pilot project implemented by KISOSZ [Representative Association of Hungarian Traders and Hospitality Providers] and PTE in a consortium (*ID code: GINOP-5.3.5-18-2019-00105, title: Competency-Based Assessment of the Work Ability of Aging Employees in the area of the* Ős-Dráva *[Ancient Drava River] Program*), we had the opportunity to further develop and test a methodology that jointly examined physical and mental competences, which previously had been handled separately, in a comprehensive way, revealing their reciprocal influence on each other (5).

Our study addressed the topic of measuring the physical and mental competences of employees over 45 years of age living in the Ormánság and examining their suitability for work. Approximately 1,200 people over 45 years of age live in the target area of the project, namely in the 43 settlements falling within the scope of the Ős-Dráva [Ancient Drava River] Project, primarily in Baranya County and in some settlements in Somogy County. When the grant proposal was submitted, the proportion of aging workers among registered jobseekers exceeded 20%. The rate of job seekers in Baranya County was less favourable than the national figures: employment rate stood at 58.4%, which is 2.0 percentage points lower than the national average; 14,074 people were registered jobseekers in the target area (5).

During the project period, it was possible to assess 50 people's work ability, and 250 target group members participated in a program designed to help them adapt to the labour market; furthermore, research results were presented, providing information for employers and providers engaged in labour market services in the target area (5).

4.1 Methods

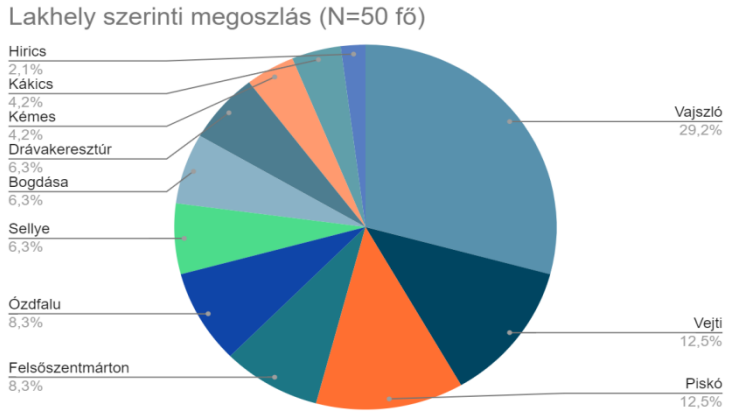
In addition to the measurement of physical competences, a complex questionnaire was responded by the subjects. The questionnaire is enclosed as Annex 1.

4.2 Study subjects

The survey took place between 21.04.2021 and 27.05.2021 in Pécs at the Centre of Excellence for Work Sciences and Occupational Health of the University of Pécs.

Of the 50 target group members included in the study, 17 were men and 33 were women. The distribution of the sample by place of residence is shown in the diagram below (Figure 2). One of the participants did not belong to the primary target group, as they were 21 years old at the time of the study. All other participants were all over 45 years of age: 10 people belonged to the age group of 60 years and above, 23 people were 50-59 years old, and 16 people were from the 45-59 age group.

Figure 2: Distribution of survey participants by place of residence (5)



4.3 Results

According to the research of recent years, the methodology of physical examinations and assessments has undergone a significant change, now providing a much more detailed picture of employability and suitability for work. In addition to the simpler medical or occupational health checks, mechanised (initially supported by instruments and then computers) data collection methods are appearing in more and more countries, which are also suitable for complex skills tests. These machines and software not only play an important role in determining work ability, but also play an increasing role with regard to people with reduced work ability, setting rehabilitation goals and assessing the possibility of rehabilitation (5).

The study population was able to achieve less than half of the specified normal values. Given that the average values were obtained from a study of individuals who had generally poor health, as confirmed by a health status questionnaire, this outcome is not surprising (5).

Fundamental differences can be established between the motor performance of men and women, which can be attributed to biological factors and the different muscle structure. There was no significant difference in concentration and tolerance for monotony, but both groups performed far below the specified average. The older the subjects were, tolerance for monotony decreased significantly (5).

In terms of health status, about two-thirds of the examined persons smoke, and about the same proportion also take some kind of medicine. Their disease profiles were practically identical to those typical in Hungary. Hypertension affects more than half of the study population, while 14% suffers from diabetes, and consequential cardiovascular diseases were recorded in 16%. Musculoskeletal disorders are very common, affecting more than a quarter of the subjects, which is understandable given that the respondents mainly have primary education, which predisposed them to become blue-collar workers. More than two-thirds of the examined group reported pain and malaise (5).

With regard to their mental state, more than half of the respondents indicated minor problems, but 68% did not suffer from anxiety/depression. As regards burnout, the proportion of moderately and severely burnt-out people was 88%, which is a surprisingly high figure. Exhaustion was indicated by 62% (5).

My research tries to draw attention to the methodology compiled in the study, which can be used to gain in-depth knowledge about the physical and mental health and work ability of employees. Based on these data, work ability can be objectively measured, any changes over time can be monitored, and it can help in creating working conditions suitable for the employees' abilities, and in determining the direction of retraining for those with reduced work ability. The foregoing has enormous financial and social implications. The complex work ability assessment methodology used by our working group for the target group of the project is a novelty and lays the foundations for the creation of the necessary uniform national standards. We recommend its widespread introduction in the world of work (5).

4.4 Discussion

The results of the research carried out in the Ormánság were consistent with the experiences of specialists conducting research in this field, confirming the hypothesis that it is important to deal with the problems of employees over 45 years of age. In addition to the high proportion of long-term jobseekers, poorly educated people and people with outdated skills and qualifications, the effects of various national trends also manifest themselves in the Ormánság region. With the increase in life expectancy at birth and the rising proportion of elderly people in society, it has become extremely important that aging workers stay active. The continuous delay of the retirement age and the care of older generations place a heavy burden on employees over 45 years of age (117, 118). Poor health further reduces work ability, hurting the chances of target group members. Those jobseekers who do not have access to the necessary health screenings are in a particularly difficult situation (5).

Overall, it can be concluded that an aging society can pose a threat to the sustainability of the economy and the pension system. However, the problem cannot be remedied solely by continuously raising the age of retirement. During the assessment of physical stamina, the people conducting studies revealed a number of difficulties that hinder work. Work ability and its preservation are a key issue from a socioeconomic point of view (5).

Eszter Barakonyi (66) stresses that willingness to work is particularly high among the aging population. Also in this research, those conducting the assessments identified a number of motivated target group members, but this alone, without creating the necessary working environment and labour market security, is not sufficient. It is essential to improve working conditions and create optimal conditions for special groups of employees – even in parallel with raising awareness among employers –, and it would be important to take a preventive approach, i.e. to prepare young and aging workers for longer activity in the labour market, one of the steps of which is to improve health and increase health literacy. Furthermore, based on our results, regular health checks of aging employees, their assistance with mentoring, and the implementation of further research and assessments are also warranted (5).

5. Examination of Internet addiction

Internet addiction (hereinafter also referred to as “IA” or “problematic Internet use”) is now a well-known phenomenon that has been studied by science for about three decades (108). Similar to other types of addiction, it can be defined as persistent, problematic,

excessive, compulsive (Internet) use leading to the deterioration of the individual's functioning in various areas of life (119). Internet addiction is not a specific diagnosis but should be considered an umbrella term that covers all aspects of harmful Internet use. This includes, for example, the excessive use of online games, porn movies, and social media, as they all cause similar symptoms; users with IA are unable to control their online activity, which thus has a harmful effect on their lives (120, 121).

Despite the fact that many comprehensive studies have been devoted to this topic in the last three decades, the precise identification of problematic Internet use is still a challenge. This is due to the lack of scientific consensus and clinical trials (119). On the other hand, the incidence of Internet addiction is constantly increasing as time passes. Currently, up to 7% of the entire population of the Earth may be affected (121, 122).

Despite the dynamically growing literature, relatively few studies deal with the impact of Internet addiction on physical health (127). It is possible that health-related quality of life is lower among Internet addicts, which may be related to the aforementioned mental problems, but the results of previous research are contradictory (127, 131). Recent studies have also shown a possible link between burnout and Internet addiction (132, 133).

Burnout (similar to problematic Internet use) is also an increasingly widespread phenomenon, which has different underlying causes, both from an individual and organisational point of view (134). According to the generally accepted theory of Christina Maslach and her work group, burnout can be characterised by emotional exhaustion (depletion of physical and emotional resources), depersonalisation (unrealistic feelings and thoughts) and reduced personal performance (a feeling of incompetence and reduced productivity and performance at work) (134, 135). Similar to Internet addiction, neither the definition nor the clinical classification of burnout is adequately clarified; it is still labelled as a work-related phenomenon (134).

Workplace factors are primarily responsible for the onset of burnout, but individual characteristics (personality traits) also play an important role in it. Similar to problematic Internet use, high adaptability and neurosis may also be significant factors in burnout (132, 136).

This phenomenon has a significant impact on both the individual and society, as it may have undesired consequences such as emotional exhaustion, loss of energy, dehumanisation, work disengagement, feelings of inadequacy, reduced productivity and

coping skills, and it may also be associated with mental and physical complications such as depression, insomnia, cardiovascular disorders, and chronic pain syndrome (132, 137). Burnout can also lead to drug, alcohol, or drug abuse/addiction, as well as the development of addictive behaviours such as problematic Internet use and Internet addiction (138).

5.1 Methods and study subjects

The survey was conducted between January 2020 and August 2020 at 14 educational facilities in Hungary. This was a cross-sectional prospective study using paper-based questionnaires (121).

The study protocol and documentation had been approved by the Regional Ethics Committee (Ethics Committee, University of Pécs, approval number: 8434-PTE 2020). The information sheet was read and signed by the participants before starting to fill out the questionnaire (121).

Selection criteria included working as a secondary school teacher (public employee, subcontractor, etc.), being between the ages of 18 and 65, and being employed at the time of the survey (121).

Exclusion criteria included refusing to participate in the study, being on permanent leave, and being younger than 18 years of age or older than 65 years of age (121).

Demographic data included age, sex, marital status, number of children, type of work, years of employment, work schedule, legal relationship, and second job. Risk factors and medical conditions included smoking, alcohol and illicit drug use; the presence of diabetes, high blood pressure or ischemic heart disease; history of musculoskeletal pain and depression (121).

We also assessed the daily time spent online, the daily time interval spent browsing the Internet, and the goals of Internet use (121).

5.2 Results

A total of 1,817 responses were received out of 2,500 distributed questionnaires, which represents a response rate of 72.7%. 623 men (34.3%) and 1194 women (65.7%) were included in our analysis.

Based on the results of the Problematic Internet Use Questionnaire (PIUQ), Internet addiction was detected in 5.2% (95/1817) of the study population.

Based on the Maslach Burnout Inventory, 26.0% of our study population (473/1817) suffered from mild, 70.9% (1288/1817) from moderate, and 3.1% (56/1817) from severe burnout. Internet addiction was associated with severe burnout (10.5 vs. 2.7%, $p < 0.001$) (Table 11).

There was a weak but significant correlation between the severity of Internet addiction and burnout (total scores) ($r2 = 0.2$, $p < 0.001$) (Table 12).

Table 12: Correlation between Internet addiction and the subcategories of burnout, depression, insomnia, and quality of life (121)

		MBI	BECK	AIS	Mobility	Self-care	Daily activities	Pain
PIUQ	Pearson correlation	0.200	0.558	0.325	0.143	0.266	0.263	0.181
	p value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Average values of the subcategories were as follows: emotional exhaustion 22.1 ± 9.1 points, depersonalisation 9.8 ± 4.6 points, personal performance 20.9 ± 6.9 points. Internet addiction is associated with more severe emotional exhaustion (25.6 ± 10.9 vs. 21.9 ± 8.9 points, $p < 0.001$) and depersonalisation (12.7 ± 5.9 vs. 9.8 ± 4.5 points, $p < 0.001$) but not with personal performance (121).

Considering all subcategories, Internet addiction was associated with a lower quality of life ($p < 0.001$ in all cases). There was a weak yet significant correlation between these subscales and the severity of IA ($p < 0.001$ in all cases) (Table 12) (121).

The overall prevalence of Internet addiction is about 7% in the total population and occurs predominantly in young people (adolescents). The 5% rate of problematic Internet use obtained in our study is comparable to these results and similar to the results of other publications, including those relating to the Hungarian adult population (81, 133, 134).

Internet addiction is also associated with a worse quality of life, which is primarily manifested in difficulties in self-care and more frequent occurrence of pain. Spending hours on the Internet can lead to a sedentary lifestyle and the development of forced posture, which plays a role in the development of chronic musculoskeletal pain, one of the main reasons for absenteeism from work. Moreover, each hour spent in front of the computer increases the risk of becoming overweight by 8%. The listed factors (psychological and physical) clearly lead to difficulties in self-care and not only hinder daily work, but also affect the quality of life.

Internet addiction may be associated with mental symptoms such as depression and insomnia. Depression (especially severe depression) is a disabling condition for the individual and a great burden on society; it is forecast to be the leading cause of disability by 2030 and one of the leading causes of death due to increased suicide rates. Recent studies have shown a correlation between depression and Internet addiction among adolescents, but there is a lack of data on the adult population (149).

Our study showed that the proportion of those suffering from moderate to severe depression was higher among problematic Internet users, and the severity of depression was significantly correlated with the severity of problematic Internet use. Based on the multivariate analysis, depression remained a significant parameter associated with Internet addiction. The causal relationship is not completely clear. Based on recent findings summarised in a meta-analysis, Internet addiction was significantly – at least three times – higher, in those with suicidal thoughts and ideation and those who have attempted suicide, which highlights the importance of screening and prevention (150).

The relationship between problematic Internet use and depression is not fully understood. Personality traits and previous depression may have a significant impact on the development of Internet addiction, or they can mutually reinforce each other. Internet addiction, being an addictive behaviour, may also lead to depression (120, 133, 151). In our previous study, depression was not associated with Internet addiction, which raises the possibility of Internet addiction and subsequent depression. This topic requires further analysis (142).

Insomnia may be a consequence of prolonged Internet use in adolescents, but its connection with Internet addiction has been investigated only a minor degree in the adult population (152, 153). Similar to the samples of adolescents, in our study both insomnia and severe insomnia were associated with problematic Internet use in both univariate and multivariate analyses. The underlying pathophysiology is also not clear. Insomnia may predispose to nighttime Internet use, which may lead to addiction or problematic Internet use later (nighttime Internet use is one of the strongest predictors of addiction), which may result in poor sleep (142, 153).

The relationship between burnout and IA is also rarely documented. According to experts, burnout can also be associated with problematic Internet use, but the results are contradictory (133, 154). In a Japanese national study, burnout was associated with problematic Internet use, but no significant results were found in the sample population based on the questionnaire used (134). Among problematic Internet users, the frequency of severe burnout is higher; they scored higher on the emotional exhaustion and depersonalisation scales, and a weak yet significant correlation was found between IA and the total burnout score. Based on recent publications, emotional exhaustion may lead to anxiety and the deterioration of communication skills, which may result in subsequent social isolation and depersonalisation, which may lead to turning to the Internet as a coping method and ultimately to the development of problematic Internet use (133, 134). However, burnout was not a significant predictor of Internet addiction based on a multivariate analysis.

Internet addiction has been associated with reduced physical activity, obesity, chronic pain syndromes, mental health problems, disrupted circadian rhythm, as well as emotional and social issues associated with low quality of life (131, 155). In our study population, Internet addiction can be associated with depression, insomnia, and burnout, which, based on the results of the questionnaire, may be responsible for the deterioration of the quality of life of Internet addicts. There was a weak yet significant correlation between problematic Internet use and the aforementioned subscales. Interestingly, quality of life was not significantly associated with problematic Internet use in the multivariate analysis.

5.3 Discussion

My dissertation focuses on the relationship between Internet addiction and depression, insomnia, burnout, and quality of life in adults. One in twenty teachers suffered from

problematic Internet use (which is a very high rate). A strong correlation was found between the examined parameters, raising the possibility that problematic Internet use is not only a phenomenon of mental instability in adolescents. Although this was a prospective study involving a large number of high school teachers, it was not representative of Internet addiction among teachers or the adult population. This being a cross-sectional study, causal relationships could not be fully clarified (121).

6. Conclusion

In the summary of my research, I will present the new scientific results of my doctoral dissertation. I do not wish to repeat the correlations presented in the summaries of previous chapters, instead I interpret my results in a broader context, highlighting their novelty and innovative nature.

By means of our research presented in connection with the practical use of the ErgoScope system, we developed and tested a protocol for making medical findings that enables the creation of comprehensive, clear, structured medical findings and shorter, targeted examinations. In the first round, instead of 20 measurement results, 5 large categories were created, which included the following: 1. static effort, 2. dynamic effort, 3. fine motor movements and tolerance for sedentary work, 4. attention and tolerance to standing work, 5. tolerance for monotony (50).

The protocol was developed within the framework of the EFOP Project with the aim that the system can be used more effectively in promoting the employment of the aging workers. In Hungary, the employment of aging people and its promotion are included in various strategies. In most cases, the pivotal elements of these strategies are the same, inform various policies and follow European values. Addressing the social problems of an aging population requires a complex approach. Therefore, based on the results of scientific research devoted to aging and maintaining existing good policy practices, it is necessary to introduce improved cooperation-based methods in health care, social affairs, economic policy, employment, activation tools and care systems.

However, according to my findings, employment of the elderly is not given sufficient emphasis in employment policy and labour market strategy when it comes to identifying the potential labour pool. Employers expect state interventions and aids in many cases, including in this area, and are less prepared for the integration of the elderly.

I have examined the practical use of the ErgoScope system in the case of the project conducted in the Ormánság geographical region. The socioeconomic and environmental processes of the 21st century also have a serious impact on the labour market of the Ormánság. The employment indicators of the stagnant and aging population are unfavourable, and a typical trend is the migration to the more developed central areas of the country that provide more favourable living conditions. The local communities are often not strong enough or do not have the financial and human resources required to overcome the increasingly serious problems, which is why the involvement of external resources, market, state, government initiatives, subsidies and sources is of great importance in the Ormánság.

During the research, the ErgoScope system was used (for the examination of physical competences) in combination with questionnaires also measuring mental competences. In this context, my important conclusion is that, in the field of occupational health, it would be advisable to supplement medical examinations with psychological, social, and occupational health examinations, particularly for groups at a disadvantage on the labour market.

It is important for the examined person to receive feedback on what obstacles they might have to face due to their altered work ability, what consequences the health impairment has on working, and what jobs they can perform considering their current skills, as well as how to get closer to the healthy state within the framework of complex rehabilitation.

It is very important to map the individual's physical and cognitive abilities and certain personality traits in order to be able to predict the outcome of employment rehabilitation and their subsequent performance. Nowadays, employee retention and the development of human resources have become indispensable in the vast majority of jobs (this is particularly true for the health-social and construction sectors), because the number of people changing their careers and going to work abroad has increased significantly. Retaining and preserving the health of employees plays an important role, since with the burnout of overworked employees results in a decline of their working capacity and performance, and consequently in the quality of the service they provide, which has a serious impact on the lives of the most vulnerable members of our society.

The third topic I investigated was Internet addiction. Compulsive out-of-control Internet use that completely transforms the lifestyle of a person is considered a new syndrome among addictions. The entire lifestyle of Internet addicts is transformed, although its definition and medical classification of this are still a matter of debate. It is fact that those

involved are unable to reduce their Internet use voluntarily, possibly even upon request, and in the absence of Internet, they have symptoms similar to substance withdrawal syndromes, such as nervousness, restlessness, and irritability.

Research in recent years has pointed out that Internet addiction is also one of the dependencies. Functional MR examinations show differences in brain structures among problematic Internet users, which correlates with the severity of the addiction. With the spread of digitalisation and the growth to adulthood of today's youth, Internet addiction will presumably pose an increasing challenge for health care systems.

Internet addiction is an extensively studied phenomenon among young people, but only a few previous studies have addressed its incidence and consequences in middle-aged or older populations.

My research on secondary school teachers draws attention to the challenges related to Internet use of a group who, as part of their work, can themselves do a lot to make the Internet usage habits of the next generations more favourable.

My dissertation also draws attention to the potential risk factors of Internet addiction, such as Internet use during working hours (school hours) or at night, the duration of online activity and the impact on family circumstances.

About twenty of the teachers involved in the study suffer from Internet addiction, which highlights the importance of this topic and prevention. Based on our results, childless male workers under 35 years of age who have a second job and use the Internet for several hours a day are particularly at risk.

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