THE RAISON D'ETRE OF WORK DIAGNOSTIC TESTS IN THE WORK SAFETY OF DISABLED EMPLOYEES

ELENGEDHETETLEN MUNKAALKALMASSÁGI VIZSGÁLATOK FOGYATÉKOSSÁGGAL ÉLŐ MUNKAVÁLLALÓK MUNKABIZTONSÁGÁBAN

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Abstract

According to the Hungarian Act on Occupational Safety and Health (Mvt. 50/A § 63), workers from vulnerable groups should be protected from the risks specially affecting their health. The requirements and suggestions of safe and healthy working environment are determined by occupational safety and health (OSH). Workers from vulnerable groups are assessed differently from healthy workers in terms of occupational risks, because occupational health professionals are underinformed about their mental and psychical abilities, special needs and the assistive technologies they use. The OSH and occupational health professionals are under-informed about the comprehensive safe employment of workers from vulnerable groups. During profession or career choice guidance the assessment of the student's or candidates' fitness for the job is harder due to the lack of information, so it is necessary to develop professional guidelines based on ability tests and job simulator surveys.

Keywords

work simulator, ability test, work diagnostics, occupational health, career choice

Absztrakt

A Mvt.50/A. § 63. alapján a sérülékeny csoportba tartozó munkavállalókat óvni kell az őket különösen érintő egészségkárosító kockázatoktól. Az egészséget nem veszélyeztető és biztonságos munkavégzés követelményeit és ezek biztosítására javaslatokat a munkavédelem határoz meg. A sérülékeny munkavállalók esetében a testi, lelki adottságaik, speciális igényeik, az általuk használt segítő technológiák miatt a többi munkavállalóhoz képest eltérően kell felmérni, értékelni a munkahelyi kockázatokat. A munkavédelemben és a foglalkozás-egészségügybe dolgozó szakemberek alulinformáltak a sérülékeny csoportba tartozó munkavállalók mindenre kiterjedő biztonságos foglalkoztatása terén. A pályaválasztás és foglalkoztatás során az információhiány következtében a tanuló munkavállaló alkalmasságának megítélése nehezebb, ezért szükséges képességvizsgálatok és munkaszimulátoros felmérések alapján kidolgozni szakmai útmutatókat.

Kulcsszavak

munkaszimulátor, képességmérés, munkadiagnosztika, foglalkozás-egészségügy, pályaválasztás

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INTRODUCTION

The disabled persons' equal opportunities, independent living, participation in social life can be realized by the regulated complex rehabilitation process. The disabled persons are preferably employed in integrated employment; in the absence of such employment, they are entitled to sheltered employment. [1] According to the Optional Protocol and Convention accepted by the United Nations on the Rights of Persons with Disabilities, in New York on 13th December 2006, Disabled Persons have the right to seek employment in the open and accessible labour market. [2] The prohibition of discrimination is required in order to realize equal opportunities, which is enshrined in the law: „In particular, it infringes the principle of equal treatment if the employer discriminates directly or indirectly against the employee." [3] The law on the promotion of the right to free choice of employment and occupation also regulates the support of labour market programs. [4]

The workers from vulnerable groups, including people with disabilities should be protected from the workplace risks especially affecting their health [5], physical, mental, psychological, chemical, biological, psychosocial and ergonomic hazards and should minimize the presence of risk factors, wherever possible. The requirements of safe and healthy work conditions and recommendations to ensure these are defined by OSH (OSH includes Workplace Safety and Occupational Medicine, Occupational Hygiene) (Figure 1.)

Figure 1. Ensuring requirements for safe and healthy work (source: authors)

Workers from vulnerable groups are assessed differently than healthy workers in terms of their physical, mental abilities, special needs, the assistive technologies they use and occupational risks. The person's health status, individual abilities, assistive technologies used by them, special needs and job expectations (and experiences) should be all taken into account during the adaptation of the work environment and the job, or the assessment of fitness-to-work. The internationally accepted approach to work ability, the "Work Ability House Model" is the best illustration of the factors affecting work ability, which are represented as superimposed levels. [6] (Figure 2.) Following this model, it is easy to identify the levels of intervention required to achieve successful workplace integration, also for people with disabilities. The bottom two levels are skills, abilities and health, evaluation, assessment, and the development of the required skills that are essential for the employment and successful integration of people with disabilities (foundations of the higher levels of the Work Ability House).

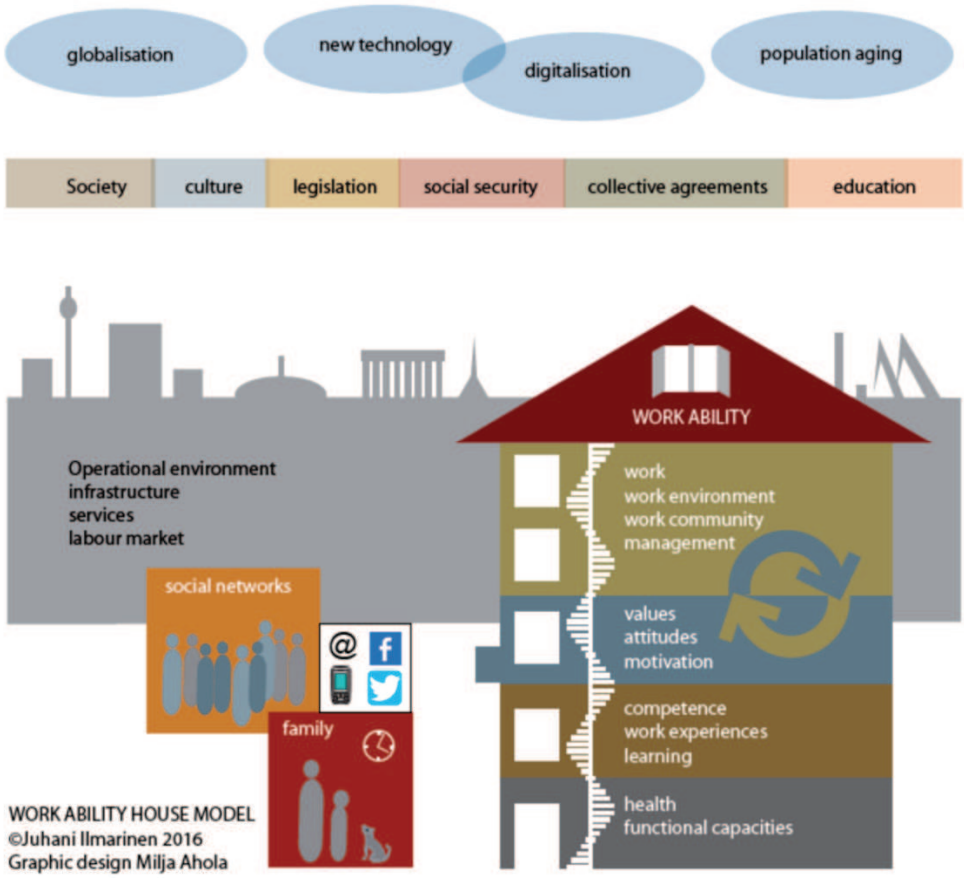


Figure 2. Work Ability House Model (Ilmarinen, 2011) [6]

During career choice, vocational training and employment, the lack of information makes it very difficult to assess the suitability of a student or employee and the OSH professionals are usually uninformed about the comprehensive safe employment of workers from vulnerable groups. Therefore, it is necessary to develop professional guidelines based on aptitude and ability tests, work simulation surveys and research. The occupational health professionals in Hungary greatly need professional guidelines that provide concrete assistance in realizing the assessment of the occupational and vocational medical fitness of persons with disabilities and placing disabled persons into new positions. Preparing such professional materials and standards is worthwhile, because professions and jobs by occupational sectors can be grouped this way. It is subservient to determine which risks factors must be considered so that a person with disability can be employed under generally defined or special conditions, or not employed. [7].

The Hungarian Province of the Piarist Order has established the "Kilátó" PiaristCareer Guidance and Labour Market Development Center (in the following: Kilátó Center), which is a new methodological and research centre. Between January and December 2018, our research team participated in the development of the professional protocols of Kilátó Center, including a methodology for instrumental work diagnostic surveys. [8] Our

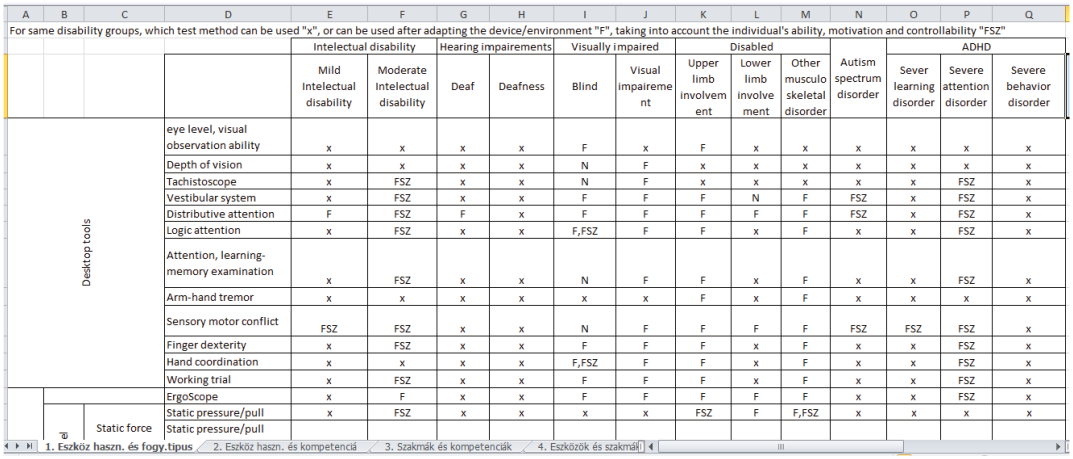
research team performs gap-based job diagnostic tests for the Kilátó Center, which form the basis for the routine introduction of ability measurements into career guidance counselling and into the examinations performed during employment.

OBJECTIVE

During our work diagnostic measurements, we aimed to optimize the measurement processes, developing a database for younger age groups and a disability specific measurement methodology. We sought to determine whether there was a significant difference in performance between male/female test subjects and which measured parameters differed by disability categories. We also compared the results with the reference values for the healthy population. The requirements for the competencies and abilities of the professions were reviewed in the available literature and we compared that data to the competencies measured by work diagnostic tests. [9] This way we set up a system of criteria for assessing fitness for profession and for work. [10]

METHODOLOGY

Most of the tests were conducted with youngsters between the age of 13 and 30 years, with SEN (Special Education Needs). Participants in the study had applied for the survey through partner organizations and schools. The tests were performed on the ErgoScope work simulator which consists of three measurement panels, which were developed in Hungary, and on 9 different portable desktop aptitude measurement devices according to our measurement instructions. [11, 12] The work simulator survey took 1.5-3 hours for each person and 1.5-2 hours for work psychological abilities. It was determined for each device and subtask whether it can be used, partially used, or cannot be used for measurement by certain disability groups. (Figure 3.)



For same disability groups, which test method can be used "x", or can be used after adapting the device/environment "F", taking into account the individual's ability, motivation and controllability "FSZ"

		Intelectual disability		Hearing impairements		Visually impaired		Disabled				ADHD		
		Mild Intelectual disability	Moderate Intelectual disability	Deaf	Deafness	Blind	Visual impairement	Upper limb involvement	Lower limb involvement	Other musculo skeletal disorder	Autism spectrum disorder	Sever learning disorder	Severe attention disorder	Severe behavior disorder
Desktop tools	eye level, visual observation ability	x	x	x	x	F	x	F	x	x	x	x	x	x
	Depth of vision	x	x	x	x	N	F	x	x	x	x	x	x	x
	Tachistoscope	x	FSZ	x	x	N	F	x	x	x	x	x	FSZ	x
	Vestibular system	x	FSZ	x	x	F	F	F	N	F	FSZ	x	FSZ	x
	Distributive attention	F	FSZ	F	x	F	F	F	F	F	FSZ	x	FSZ	x
	Logic attention	x	FSZ	x	x	F,FSZ	F	F	x	F	x	x	FSZ	x
	Attention, learning-memory examination	x	FSZ	x	x	N	F	F	x	F	x	x	FSZ	x
	Arm-hand tremor	x	x	x	x	x	x	F	x	F	x	x	x	x
	Sensory motor conflict	FSZ	FSZ	x	x	N	F	F	F	F	FSZ	FSZ	FSZ	x
	Finger dexterity	x	FSZ	x	x	F	F	F	x	F	x	x	FSZ	x
	Hand coordination	x	x	x	x	F,FSZ	F	F	x	F	x	x	FSZ	x
	Working trial	x	FSZ	x	x	F	F	F	x	F	x	x	FSZ	x
	ErgoScope	x	F	x	x	F	F	F	F	F	x	x	FSZ	x
Static force	Static pressure/pull	x	FSZ	x	x	x	x	FSZ	F	F,FSZ	x	x	x	x
	Static pressure/pull													

1. Eszköz haszn. és fogy.tipus | 2. Eszköz haszn. és kompetencia | 3. Szakmák és kompetenciák | 4. Eszközök és szakmák

Figure 3. Applicability (usability) of ErgoScope Dashboards and Desktop Capacities to Different Disability Categories – detail from the original table (Jókai, Nagy [10])

During the work diagnostic measurements partial abilities were examined: static/dynamic effort, wrist effort, hand/finger effort, hand/finger skill, keyboard manage-

ment, pencil use, eye-hand coordination, depth perception, eye level, tactile perception, logical ability, concentration, short-term memory, reflex time, observability, pace of work, organization of work. We determined which sub-capabilities can be tested by which device. [8, 10]

In each case a measurement identifier was created to ensure anonymity. After the tests, the measurement data were stored electronically, and we used IBM SPSS Statistics 23 for analysis. The results of the surveys and the methodological manuals were documented in detail for the Kilátó Center. [10, 11]

RESULTS

In our study we processed the measurement data of 150 people with the ErgoScope work simulator, 13-30 years old, most of them with SEN. We classified disabled people into 7 categories, based on different disability groups: mild mental retardation, moderate mental retardation, attention deficit, disability, autism spectrum disorder (ASD, Asperger syndrome), visually impaired, hearing impaired. We examined 100 persons with the help of the ErgoScope work simulator: 46 students, 16 jobseekers, 30 actively employed persons with disability and 8 healthy persons. (Figure 4.) Another 50 persons were tested and evaluated with the help of desktop aptitude tests: 34 person with disability and 16 healthy person. (Figure 5.)

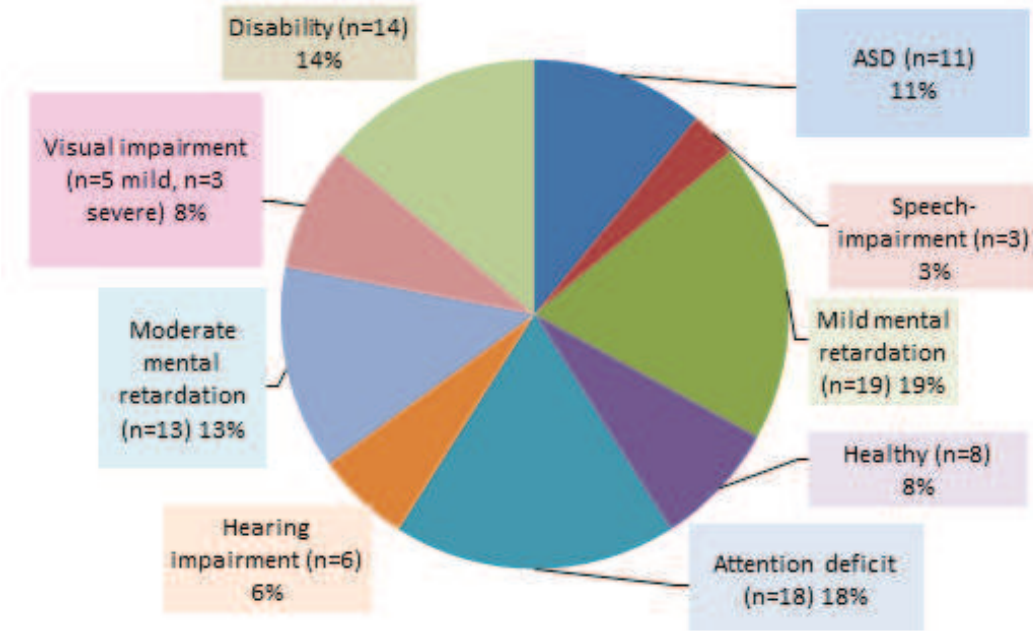


Figure 4. Distribution of persons tested by ErgoScope work simulator (Jókai [10, 13])

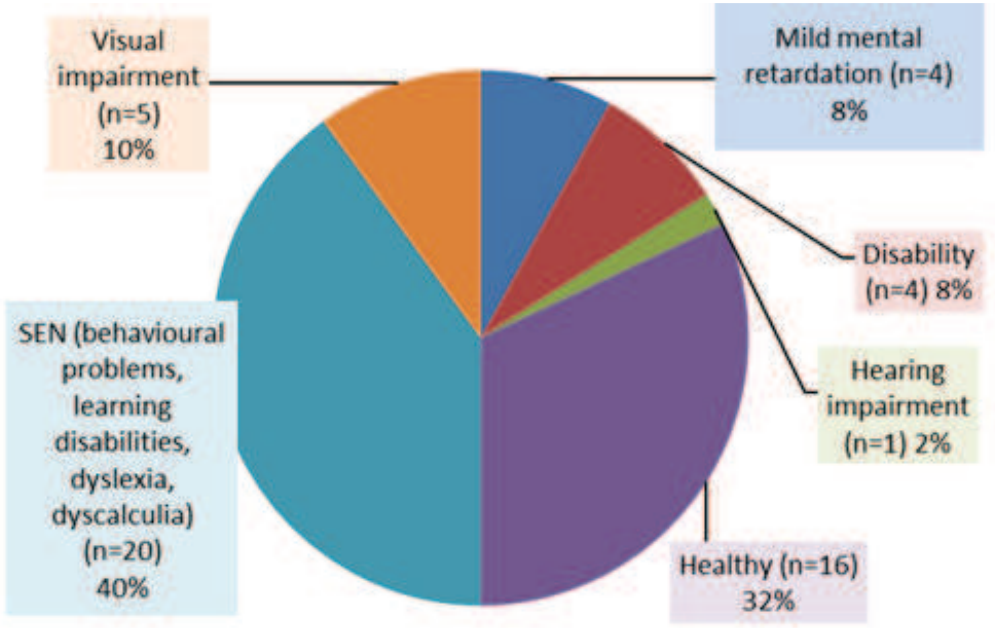


Figure 5. Distribution of persons tested with the help of desktop aptitude tests, devices by affinity (Jókai, Nagy [10, 13, 14])

The results showed a significant difference between male and female results in two-handed effort, hand and finger grip strength and reaction time. The Asymp. Sig. (2-tailed) value in regard to the grip strength of hand with the Mann-Whitney test in the case of men was 0.000, and in the case of women was 0.252. No significant differences were detected between male and female results in regards to touch, keyboard management, pencil use, using rotary knobs and switches, workload and monotony tolerance measurement tests.

The ErgoScope Work Simulator studies show that the best results were found in the case of people with attention deficit, autism and hearing impairment, after that in the case of disabled persons and in some tests (keyboard management) the visually impaired persons were better. The simplest and shortest test, the „button management" was performed by people with moderate mental retardation with a good average score (19/20 hit). Visually impaired young people generally performed better in the keyboard management and tactile exercise. In the rotary knob controlling/using (attention, eye-hand coordination) persons with attention deficit achieved the best scores and young people with intellectual disabilities performed the worst. (Table 1.)

Exercises	Healthy	Visually Impairment	Attention Deficit	Mild Mental Retardation	Down sy.	Challenges
Touch (righht hand, 20 objects, error-free, pieces)↑	**19.70**	13.86	**13.33**	**7.55**	**4.86**	Knowledge of mathematical concepts, coordination with unseen hand
Rotary knob operation at breast height, with dominant hand, recording the degree of deviation, (absolute error)↓	**25.69**	**81**	**35**	**173**	**187**	Attention, eye-hand coordination ability , motivation
Keyboard management with both hands, left sign+space, 100 times, (keystroke average time)↓	**21.87**	14.63	**26.65**	**40.87**	**54.96**	Attention, eye-hand coordination ability , motivation

Table 1. Results of some partial ability tests by the disability groups (Jókai [10, 13])

We could not calculate disability-specific measurement differences because only a few people with disabilities were tested with the help of the desktop aptitude tests. 32% of the people tested were healthy and 40% had behavioural problems, or learning disabilities, dyslexia, dyscalculia. (Figure 5.) There was no significant difference between the results of these persons except for one or two cases. This way these data will also be used in conjunction with the data recorded with the help of other desktop aptitude tests that are still being processed to form new reference values. Establishing reference values is one of the main goals of our ongoing research, because no international reference values are available for the Hungarian work diagnostic tools we used in our study.

For the ErgoScope work simulator, we had a measurement reference database, based on performance data for healthy and tested people, and we created 3 categories (under 50%, between 50-80% and above 80% performance). In the case of desktop aptitude tests, the standards developed by the manufacturer were used (V – excellent, IV – good, III – average, II – poor, I – very poor). Now, we are currently in the process of developing an evaluation system based on our own performance averages, which evaluation system is similar to the 3 result categories used for the ErgoScope work simulator.

Based on our measurement and testing experiences, we have processed and tabulated the complex analysis of 30 professions, 22 parameters from work situations measured with the help of the ErgoScope work simulator, 12 test methods with the help of desktop aptitude tests and 6 groups of disabilities. [10, 14]

The tables include:

- Usability and conditional usability of measurement/test methods for certain disability groups;
- Which competencies and abilities can be measured by which measurement/test methods;
- What competencies and abilities are needed to get certain professions and later to work in that profession;

- Which test method is worth using for the chosen profession. It was an important aspect that the results obtained during the examination could facilitate the work of the school doctor/occupational physician during occupational/professional medical fitness tests.

CONCLUSIONS

Work diagnostic tests are adequate for measuring objective and reliable performance survey. However, currently there are not available normalized and standardized reference metrics. Thus in our future research, we aim to collect more large amounts of data to create reference values.

The ErgoScope work simulator and portable aptitude testers provide objectively measurable data on certain ability and capacity parameters of the tested person, thus these work diagnostic tests can be used effectively in professional/occupational medical fitness tests. In the case of persons with disabilities, the work-related diagnostic measurements can provide particularly important information. These cases are: assessing fitness-for-profession (pre-school), fitness-for-work (pre-employment), and, in the context of occupational rehabilitation, persons with disabilities returning to work or entering the labour market.

Based on our experiences of this research we found that we can develop guidelines and policies for the professionals of occupational safety and health professionals and employers. These measurement protocols for ErgoScope Work Simulator and Desktop/Portable Ability Testers [10], can facilitate the assessment process and safe employment of vulnerable workers, including people with disabilities.

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