

International Journal of Occupational Safety and Ergonomics

ISSN: 1080-3548 (Print) 2376-9130 (Online) Journal homepage: www.tandfonline.com/journals/tose20

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To cite this article: Maja Belevska, Jovica Jovanovic, Emilija Gjosevska Dastevska & Zoran Velkovski (2021) The importance of individual predictors and psychosocial working conditions in assessing the work ability index of people with low vision, International Journal of Occupational Safety and Ergonomics, 27:2, 442-451, DOI: 10.1080/10803548.2019.1613811

To link to this article: https://doi.org/10.1080/10803548.2019.1613811

Published online: 27 Jun 2019.

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International Journal of Occupational Safety and Ergonomics (JOSE), 2021
Vol. 27, No. 2, 442–451, https://doi.org/10.1080/10803548.2019.1613811

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The importance of individual predictors and psychosocial working conditions in assessing the work ability index of people with low vision

Maja Belevska [a*], Jovica Jovanovic[b], Emilija Gjosevska Dastevska[c] and Zoran Velkovski[d]

[a]*Department of Ophthalmology, Clinical Hospital Bitola, Republic of North Macedonia;* [b]*Faculty of Medicine, University of Nis, Serbia;* [c]*Faculty of Medicine, University of Skopje, Republic of North Macedonia, Skopje;* [d]*Department of Medical Biochemistry, Clinical Hospital Bitola, Republic of North Macedonia*

Purpose. This investigation aimed to clarify the importance of individual predictors and psychosocial working conditions in estimating the work ability index (WAI) of people with impaired vision. *Materials and methods*. This study utilized a quantitative cross-sectional design involving 450 respondents who had low vision with visual acuity in the range of 0.05–0.3 and a control group of 150 respondents with visual acuity in the range of 0.5–0.3. The investigation was conducted using the standardized instruments of the Copenhagen psychosocial questionnaire (COPSOQ) and the WAI. *Results*. The average WAI score of the respondents with low vision was 30.1 ± 4.1 and that of the control group was 34.7 ± 3.4. Results indicated a positive COPSOQ/WAI correlation in the following domains: work importance; career prospects; rewards/feedback; role and definition; quality of management; social support; job satisfaction; health condition. Negative correlations were indicated in the following domains: quantitative, cognitive and emotional demands; exhaustion; stress. *Conclusions*. The WAI of people with low vision is both positively and negatively impacted via different intensities associated with complex correlations, including: gender; age; profession; stress propensity; quantitative, qualitative and emotional demands of work; specificity of work, professional education; presence of stressors.

Keywords: individual predictors; psychosocial conditions; work ability index; people with low vision

1. Introduction

Vision impairment represents a clinical stage in the development of many eye diseases in which the terminal stage can evolve into a severe degree of visual impairment. This represents not only an ophthalmologic but also a sociological problem for the people affected [1]. Preserved eyesight is one of the main preconditions for the general population to function normally, which is the reason behind visual impairment significantly affecting the quality of life, work ability and work performance of those affected regardless of their sociodemographic characteristics and occupations [2]. Therefore, impaired vision is a significant contributor to morbidity and is strongly correlated with psychosocial and other conditions of the work environment. In addition, the visual degradation process significantly affects the work ability, choice of profession, employment opportunities, work productivity and assessment of the achieved results of people with low vision [3–5].

Work ability is the ability of an individual to perform any type of work that can be valued, the ability of an organism to maintain an internal physiological balance during and after the completion of the activity and the ability to quickly and thoroughly establish all forms of physiological homeostasis that deviate from the normal values during work. Different from the case of those with preserved vision, whose work ability is determined by the functioning of various organ systems and depends on the health, physical and sensory ability of the organism, determining the work ability of a person with low vision is a complex problem. Particularly, in addition to medical problems, many times these impairments result in legal provisions, including driving restrictions. The work ability index (WAI) is used universally to assess the work ability of an individual [6,7].

Healthy vision is fundamentally involved in various work processes and is particularly necessary in professions that require a high degree of visual preservation [8–10]. Few reports attempt to identify the predictors of the work environment that are most important and determine the extent to which each influences the preservation of work ability (i.e., in the valorization of the WAI of people with low vision). This further emphasizes the need to define factors that affect work ability, whereby today's emphasis is placed not only on the health status of the people and the singularity of the job and the workload, but also on the complex interrelated psychosocial conditions of the work environment that play the role of

*Corresponding author. Email: maja.belevska@yahoo.com

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predictor and are crucially important in the assessment of the WAI.

Assessing work ability determines the compatibility of the biological potentials and functions of an individual with the requirements of a job and the characteristics of the work conditions. In everyday practice, work ability can be expressed through the WAI [11–13]. Factors such as gender, age, profession, health status, individual and contextual personality traits and psychosocial conditions at work affect the WAI scores [7,14–17].

Taking as given the large gaps in the literature regarding this topic, this investigation aimed at clarifying the complex correlations, effects and consequences of the influence of the mentioned factors on the work ability of people with low vision from various professions. Moreover, we sought to determine the psychosocial conditions and other factors involved in the process of work that have the significance of a predictor, as well as the manner in which they affect the WAI of people with low vision. While researching the psychosocial factors, we analyzed the following parameters that affect the WAI: job requirements; work organization; singularity of the job and the workload; level of expertise and education; quality of management; general health status; individual and contextual personality traits; management team. We have grouped these parameters into four dimensions: job requirements; work organization and career prospects; relationships of employees with their superiors in the work process; effects/consequences of the psychosocial predictors in the work process.

The literature was searched thoroughly and we use reference material and pre-knowledge, coordinated and supplemented by the results and findings obtained from several relevant studies [18,19].

Results from this investigation contribute to the illumination of the complex associations and individual, contextual and psychosocial relationships with the work ability of people with low vision who are involved in the work process, expressed through the WAI.

2. Subjects and methods

2.1. Study design

This investigation utilized a cross-sectional study design with a quantitative analytical approach.

2.2. Subjects

Six hundred respondents were involved in the present study: 450 people with low vision, such as those with glaucoma, diabetic retinopathy and ophthalmic diseases with refractory anomalies and with preserved visual acuity of 0.05–0.03; and 150 people with preserved visual acuity of 0.5–0.3 in the control group, according to the International Classification of Diseases 10th Revision (ICD-10) classification. The choice of respondents was based on inclusion and exclusion criteria related to age, degree of visual impairment and type of ophthalmic disease. Inclusion into the low vision group required low preservation of visual acuity, in the range of 0.05–0.3, and the control group required preservation of visual acuity of 0.5–0.3. The participant's age was required to be older than 25 years, with the condition that their low vision was caused by ophthalmological diseases such as glaucoma, diabetic retinopathy and refractory anomalies.

2.3. Methods

Among the respondents involved in the study, visual acuity was determined by clinical ophthalmologic examination using appropriate ophthalmic equipment, which determined visual acuity at a distance and in proximity and the degree of visual preservation according to the ICD-10 classification.

Assessment of the impact of psychosocial conditions of the work process on the WAI of the respondents was conducted using the National Center for the Work Environment's Copenhagen psychosocial questionnaire (COPSOQ) and the WAI from the Finnish Institute of Occupational Health (FIOH). Both questionnaires have been designed and accepted in many European countries as standardized questionnaires in scientific research. All data were collected by trained examiners, and the respondent's involvement was voluntary. The anonymity and confidentiality of the answers were guaranteed, and the internal credibility and consistency of the data were tested with Cronbach's α coefficients.

The COPSOQ has been designed and accepted as a standardized measuring instrument around the world and is used to study and follow the connection and impact of psychosocial factors of the work environment on work ability. In the present investigation, we used a COPSOQ variant consisting of 23 domains (questions), 17 of which are dual, divided into five dimensions, and for each answer to set domains (questions) an adequate score of 1–5 points was calculated. The analysis of the scores obtained through the implementation of this test enabled us to derive basic understanding and arrive at conclusions regarding the connection to and the impact of the psychological factors of the work environment on work ability and risk assessment at work. Furthermore, considering adequate measures and interventions for their elimination, this technique improves the work conditions and health preservation of employees and the prevention of morbid conditions [20,21].

The WAI questionnaire is a standardized questionnaire created by the FIOH and is used to assess the WAI in everyday life practice and scientific research. This test can identify the risk factors that affect work ability; however, it can also be used as a selection method for the assessment of

the results of intervention measures applied and as a program for detecting the influence of negative factors that affect the reduction of work ability, with the aim of improving individual work ability and the health of employees in various professions.

The WAI questionnaire consists of seven dimensions – related to self-assessed current work ability, work ability in relation to job requirements, number of current illnesses, assessment of inability to work due to illnesses, sick leave during the 12-month period, self-assessment of work ability for 2 years and psychic abilities – composed of one, two or three domains (questions), and for each of the answers 0–5 points are given. The total WAI cumulative score can range from 7 to 49 points. Assessment of the WAI was done by calculating the total score of the points obtained, and a total score for the answers in the range of 7–27 points indicated a poor WAI score, 28–36 points signified a moderate WAI score, 37–43 points indicated a good WAI score and 44–49 points denoted an excellent WAI score [22,23].

2.4. *Statistical analysis*

All data were processed using a descriptive and comparative statistics method, using SPSS version 17.0. The attributive (qualitative) series were analyzed by determining the coefficients of ratio, proportion and rate, and were presented as absolute and relative numbers. Numerical (quantitative) series were analyzed by finding the measures of central tendency (average value; median, minimum and maximum value; interactive range) and dispersion measures (standard deviation and standard error).

The Pearson χ^2 test for homogeneity, the Yates corrected test and Fisher's exact test were used to determine the difference between attributive dichotomous features.

The Pearson (r) correlation coefficient was used to determine the association between numerical home group statistical series, and the Spearman correlation coefficient was used to determine the association between numerical non-homogeneous statistical series.

In order to test the significance of the difference between the parameters analyzed, depending on the type and distribution of data, Student's t test for two independent samples, analysis of variance (ANOVA) for multiple independent samples and the non-parametric Mann–Whitney U test for independent samples were used.

Univariate regression analysis was used to assess the impact of psychosocial factors on the WAI, the coefficients of linear regression (B) as well as their 95% confidence intervals (CIs) were shown and the evaluation of the statistical significance of the coefficient value was completed using an unpaired t test. (Coefficients represent changes in the WAI score that are caused by increasing the score of independent variables for one measuring unit.) A $p < 0.05$ was considered statistically significant.

3. Results

All data collected from the respondents were analyzed according to sociodemographic parameters such as gender, age and profession. Of the respondents with low vision, 240 (53.3%) were female and 210 (46.7%) were male, and in the control group 75 (50%) were male and 75 (50%) were female. One hundred and thirteen participants (25.1%) were 20–50 years old and 337 (74.9%) were over 50 years old, and in the control group 41 (27.3%) were aged 20–50 years old and 109 (72.7%) were over 50 years of age. Of the respondents with low vision, 134 (29.8%) were office workers/administrators, 125 (27.8%) were laborers, 76 (16.9%) were farmers and 115 (25.6%) were from other professions, and in the control group 47 (31.3%) were laborers, 39 (26%) were office workers/administrators, 21 (14%) were farmers and 43 (28.7%) were from other professions.

The WAI of the low vision group and the control group subjects is presented in Table 1.

Results from the comparison between the WAI of the respondents with low vision and the control group respondents indicate the presence of a statistically significant difference between the glaucoma/control group (Mann–Whitney U test: $Z = -7.079$, $p = 0.001$), the diabetic retinopathy/control group (Mann–Whitney U test: $Z = -13.765$, $p = 0.001$) and the refraction anomalies/control group (Mann–Whitney U test: $Z = -6.610$, $p = 0.001$). All low vision/control groups (Mann–Whitney U test: $Z = -11.217$, $p = 0.001$) were in favor of the better work ability of control group respondents when compared with those with low vision, and so were the respondents from each low vision group individually.

The specific dimensions of the WAI index regarding 'Estimated work impairment due to disease' are presented in Table 2. There was a significant difference in WAI scores between glaucoma patients and those with diabetic retinopathy (Mann–Whitney U test: $Z = -7.493$, $p = 0.001$) and in WAI scores between patients with refractory anomalies and those with diabetic retinopathy (Mann–Whitney U test: $Z = -7.395$, $p = 0.001$) in favor of better working abilities of glaucoma patients and those with refractory anomalies than those with diabetic retinopathy; however, there was no statistically significant difference in the WAI scores of glaucoma patients in relation to refractory anomalies (Mann–Whitney U test: $Z = -0.322$, $p = 0.747$).

The low vision and the control group respondents were divided into two subgroups: those aged 20–50 years and those older than 50 years of age. The WAI scores of the respondents in relation to age are presented in Table 3.

The correlation of WAI scores between respondents with low vision and the control group aged 20–50 years and those over 50 years indicates the presence of a statistically significant difference in favor of better work ability of the control group than the respondents with low vision (difference between two means − two-sided: $p = 0.001$).

Table 1. WAI scores of the respondents.

Disease	*N*	Average WAI score (mean)	*SD*	95% CI for mean	Minimum	Maximum
Glaucoma	150	31.2	3.9	[30.6, 31.9]	25.9	37.2
Diabetic retinopathy	150	27.5	2.5	[27.1, 27.9]	23.7	31.8
Refraction anomalies	150	31.4	4.3	[30.7, 32.1]	25.3	37.6
Low vision group	450	30.1	4.1	[29.7, 30.4]	23.7	37.6
Control group	150	34.7	3.4	[34.2, 35.3]	28.6	40.6

Note: CI = confidence interval; WAI = work ability index.

Table 2. Work ability index scores of the low vision respondents based on disease.

	Disease		
Mann–Whitney *U* test	GL/RE	GL/RA	RE/RA
Z	−7.493	−0.322	−7.395
Asymp. sig. (two-tailed)	0.001*	0.747	0.001*

*$p < 0.05$.
Note: Asymp. sig. = asymptotic significance; GL = glaucoma; RA = refraction anomalies; RE = diabetic retinopathy.

The correlation with parameters of the WAI score/age of the respondents with low vision (Spearman rank-order correlation: $R = -0.121$, $p < 0.05$) and the control group respondents (Spearman rank-order correlation: $R = -0.172$, $p < 0.05$) of both genders, aged 20–50/over 50 years, indicates that there was a statistically significant linear negative correlation and that as age increased, the work ability of the respondents decreased in a linear fashion.

The WAI scores of the respondents in relation to gender are presented in Table 4.

Analysis of the results suggests the presence of a statistically significant difference between male and female respondents, in favor of better work ability of male respondents than female ones (Mann–Whitney *U* test: $Z = -2.191$, $p = 0.02$).

There was a significant difference between the control group male respondents, who had a WAI score of 35.1 ± 3.5, and male respondents with low vision, who had a WAI score of 30.39 ± 4.1, in favor of better work ability of the control group male respondents (difference between two means − two-sided: $p = 0.008$).

There was a significant difference between the control group female respondents whose WAI score was 34.4 ± 3.3 and the female respondents with low vision, who had a WAI score of 29.7 ± 4.1, in favor of improved work ability of the control group female respondents (difference between two means − two-sided: $p = 0.001$).

The correlation parameters of the WAI score of the respondents with low vision (Spearman rank-order correlation: $R = -0.103$, $p > 0.05$) and those of the respondents from the control group (Spearman rank-order correlation: $R = -0.111$, $p > 0.05$) of both genders, aged

Table 3. WAI scores of respondents based on age.

Age (years)	*N*	Average WAI score (mean)	*SD*	95% CI for mean	Mann–Whitney *U* test
Glaucoma					
20–50	37	31.75	3.78	[30.48, 33.01]	$Z = 1.875$
>50	113	31.09	3.96	[30.35, 31.83]	$p = 0.049$*
Diabetic retinopathy					
20–50	38	28.19	2.44	[27.38, 28.99]	$Z = 2.954$
>50	112	27.22	2.55	[26.75, 27.70]	$p = 0.003$*
Refraction anomalies					
20–50	38	32.03	4.15	[30.67, 33.39]	$Z = 2.455$
>50	112	31.18	4.29	[30.38, 31.99]	$p = 0.014$*
Low vision group					
20–50	113	30.64	3.92	[29.91, 31.37]	$Z = 2.561$
>50	337	29.83	4.11	[29.39, 30.27]	$p = 0.010$*
Control group					
20–50	41	35.55	3.22	[34.53, 36.57]	$Z = 2.098$
>50	109	34.43	3.43	[33.78, 35.08]	$p = 0.036$*

*$p < 0.05$.
Note: CI = confidence interval; WAI = work ability index.

Table 4. WAI scores of respondents based on gender.

Disease	*N*	Average WAI score (mean)	*SD*	95% CI for mean	Mann–Whitney *U* test
Glaucoma					
Male	81	31.47	3.89	[30.61, 32.33]	$Z = -1.722$
Female	69	30.99	3.97	[30.04, 31.95]	$p = 0.085$
Diabetic retinopathy					
Male	63	27.68	2.56	[27.03, 28.32]	$Z = -1.339$
Female	87	27.32	2.54	[26.78, 27.86]	$p = 0.181$
Refraction anomalies					
Male	66	31.67	4.24	[30.62, 32.71]	$Z = -1.467$
Female	84	31.19	4.29	[30.25, 32.12]	$p = 0.142$
Low vision group					
Male	210	30.39	4.06	[29.84, 30.94]	$Z = -2.191$
Female	240	29.73	4.07	[29.21, 30.25]	$p = 0.028$*
Control group					
Male	75	35.05	3.52	[34.24, 35.86]	$Z = -1.355$
Female	75	34.42	3.27	[33.67, 35.17]	$p = 0.175$

*$p < 0.05$.
Note: CI = confidence interval; WAI = work ability index.

20–50/over 50 years, suggest an insignificant negative linear correlation in favor of reduced work ability of the low vision and control group female respondents, which may reduce with age.

We also tested the WAI scores of all respondents with low vision and control group respondents according to occupation (Tables 5 and 6).

The variance analysis (one-way ANOVA) revealed a significant difference in professions between respondents with low vision and control group respondents in all correlated combinations of professions, with higher WAI scores for control group respondents.

The WAI scores are categorized as poor, moderate, good and excellent, and this categorization is presented in Table 7. A WAI score of 7–27 points indicates poor work ability, 28–36 points denotes moderate work ability, 37–43 points signifies good work ability and 44–49 points suggests excellent work ability. A correlation analysis of the WAI of the low vision/control group indicates that there was a significant difference in

Table 5. WAI scores of respondents with low vision based on profession.

Profession	Average WAI score (mean)	*N*	*SD*	Minimum	Maximum	One-way ANOVA
Laborer	29.4	125	3.2	24.1	29.4	$F = 17.854$
Office worker	31.1	134	4.8	23.8	31.1	$df = 3$
Farmer	27.6	76	2.8	23.7	27.6	$p = 0.001$*
Other	31.1	115	4.0	24.2	31.1	

*$p < 0.05$.
Note: ANOVA = analysis of variance; WAI = work ability index.

Table 6. WAI scores of control group respondents based on profession.

Profession	Average WAI score (mean)	*N*	*SD*	Minimum	Maximum	One-way ANOVA
Laborer	34.9	47	3.6	29.1	40.2	$F = 7.858$
Office worker	36.3	39	3.2	28.6	40.6	$df = 3$
Farmer	32.2	21	2.1	29.3	36.1	$p = 0.007$*
Other	34.2	43	3.2	28.9	39.2	

*$p < 0.05$
Note: ANOVA = analysis of variance; WAI = work ability index.

glaucoma/diabetic retinopathy patients (Fisher–Freeman–Halton test: $p = 0.001$) in favor of better working abilities of patients with glaucoma; in glaucoma/refractory anomaly (Pearson test: $\chi^2 = 7.81$, $df = 2$, $p = 0.002$) in favor of better working abilities of patients with refractory anomalies; in diabetic retinopathy/refraction anomalies (Fisher–Freeman–Halton test: $p = 0.001$) in favor of better working abilities of patients with refraction anomalies; and in low vision/control groups (Fisher–Freeman–Halton test: $p = 0.001$) in favor of better performance of control group respondents.

Table 7. Attributive values of the WAI of respondents in the study.

	WAI, *N* (%)			
Disease	Poor	Moderate	Good	Total
Glaucoma	42 (28.0)	102 (68.0)	6 (4.0)	150
Diabetic retinopathy	76 (50.7)	74 (49.3)	0 (0.0)	150
Refraction anomalies	43 (28.7)	88 (58.7)	19 (12.6)	150
Low vision group	161 (35.8)	264 (58.7)	25 (5.5)	450
Control group	16 (10.7)	84 (56.0)	50 (33.3)	150

Note: Glaucoma/diabetic retinopathy, $p = 0.001$ (Fisher–Freeman–Halton test); glaucoma/refraction anomalies, $p = 0.002$, $\chi^2 = 7.81$, $df = 2$ (Pearson test); diabetic retinopathy/refraction anomalies, $p = 0.001$ (Fisher–Freeman–Halton test); low vision/control group, $p = 0.001$ (Fisher–Freeman–Halton test). Significant at $p < 0.05$. WAI = work ability index.

Results for the psychosocial factors of the work environment from the WAI of the respondents are presented in Tables 8 and 9.

In the univariate regression analysis for the dimension of work demands of low vision and control group respondents, it was observed that an increase in the COPSOQ score of 1 was associated with a decline in the WAI with a significant difference in the domains of quantitative, cognitive and emotional demands ($p < 0.001$).

In the dimension organization of work and career prospects, it was observed in all low vision and control group respondents that an increase in the COPSOQ score of 1 was related to an increase in the WAI with a statistically significant difference in the work importance and career prospects domains ($p < 0.001$), whereas in the work duties and employee's influence at work domains an increase in the COPSOQ score also positively affected work ability but without any statistical significance ($p > 0.05$).

In the relationships between employees and supervisors in the work process dimension, it was observed in all low vision and control group respondents that an increase in the COPSOQ score of 1 was associated with an increase in the WAI with a statistically significant difference in rewards/feedback, role and definition, social support and quality management ($p < 0.001$). In addition, in the predictability, the employee–supervisor relationships and the fairness and reputation domains, although there was a

Table 8. Connection of COPSOQ scores to WAI scores for respondents with low vision.

	Unstandardized coefficients					
COPSOQ domain	*B*	*SEM*	β	*t*	*p*	95% CI for *B*
Quantitative demands	−1.558	0.055	−0.803	−28.529	0.001	[−1.666, −1.451]
Cognitive demands	−1.627	0.055	−0.816	−29.835	0.001	[−1.734, −1.520]
Emotional demands	−1.595	0.061	−0.775	−25.955	0.001	[−1.716, −1.474]
Employee's influence at work	1.388	0.064	0.661	18.645	> 0.05	[1.068, 1.319]
Career prospects	1.326	0.056	0.743	23.515	0.001	[1.215, 1.437]
Work importance	1.193	0.064	0.661	18.645	0.001	[1.068, 1.319]
Work duties	1.193	0.055	0.769	25.459	> 0.05	[1.281, 1.495]
Predictability	1.279	0.047	0.790	27.319	> 0.05	[1.187, 1.371]
Rewards/feedback	1.388	0.055	0.769	25.459	0.001	[1.281, 1.495]
Role and definition	1.622	0.065	0.762	24.911	0.001	[1.750, 1.494]
Quality management	1.916	0.078	0.757	24.535	0.001	[1.762, 2.069]
Social support	1.588	0.059	0.787	26.959	0.001	[1.472, 1.704]
Relationship employee–supervisor	1.197	0.062	0.671	19.159	> 0.05	[1.074, 1.320]
Fairness and reputation	1.254	0.049	0.768	25.375	> 0.05	[1.157, 1.351]
Job satisfaction	3.026	0.122	0.761	24.839	0.001	[2.787, 3.266]
Health condition	2.849	0.081	0.856	35.008	0.001	[2.689, 3.009]
Exhaustion	−1.595	0.057	−0.796	−27.815	0.001	[−1.708, −1.482]
Stress	−1.598	0.056	−0.802	−28.389	0.001	[−1.709, −1.487]
Job–private life conflict	−1.193	0.064	0.661	18.645	> 0.05	[1.068, 1.319]

Note: Dependent variable: WAI score. β = standardized coefficient; *B* = coefficient of linear regression; CI = confidence interval; COPSOQ = Copenhagen psychosocial questionnaire; WAI = work ability index.

Table 9. Connection of COPSOQ scores to WAI scores for control group respondents.

COPSOQ domain	Unstandardized coefficients					
	B	*SEM*	*β*	*t*	*p*	95% CI for *B*
Quantitative demands	−1.602	0.064	−0.901	−25.212	0.001	[−1.727, −1.476]
Cognitive demands	−1.672	0.071	−0.887	−23.387	0.001	[−1.813, −1.531]
Emotional demands	−1.579	0.083	−0.843	−19.083	0.001	[−1.742, −1.415]
Employees influence at work	1.305	0.047	0.915	27.671	> 0.05	[1.212, 1.398]
Career Prospects	1.282	0.048	0.910	26.766	0.001	[1.187, 1.377]
Work importance	1.305	0.047	0.915	27.671	0.001	[1.212, 1.398]
Work duties	1.313	0.046	0.921	28.691	> 0.05	[1.223, 1.404]
Predictability	1.451	0.047	0.931	30.931	> 0.05	[1.358, 1.543]
Rewards/feedback	1.313	0.046	0.921	28.691	0.001	[1.223, 1.404]
Role and definition	1.761	0.066	0.910	26.679	0.001	[1.892, 1.631]
Quality management	1.958	0.071	0.916	27.733	0.001	[1.818, 2.097]
Social support	1.451	0.047	0.931	30.931	0.001	[1.358, 1.543]
Relationship employee–supervisor	1.240	0.046	0.912	27.092	> 0.05	[1.149, 1.330]
Fairness and reputation	1.243	0.040	0.932	31.229	> 0.05	[1.164, 1.321]
Job satisfaction	2.938	0.096	0.929	30.642	0.001	[2.748, 3.127]
Health condition	2.627	0.103	0.902	25.394	0.001	[2.423, 2.831]
Exhaustion	−1.741	0.066	−0.908	−26.403	0.001	[−1.871, −1.610]
Stress	−1.579	0.083	−0.843	−19.083	0.001	[−1.742, −1.415]
Job–private life conflict	−1.305	0.047	0.915	27.671	> 0.05	[1.212, 1.398]

Note: Dependent variable: WAI score. β = standardized coefficient; B = coefficient of linear regression; CI = confidence interval; COPSOQ = Copenhagen psychosocial questionnaire; WAI = work ability index.

positive correlation, a statistically significant difference was not observed.

In the effects/consequences dimension, univariate regression analysis revealed in all low vision and control group respondents that an increase in the COPSOQ score of 1 was associated with an increase in the WAI with a significant difference in the job satisfaction and health status domains ($p < 0.001$). An increase in the COPSOQ score of 1 was associated with a decline in the WAI with a statistically significant difference in the exhaustion and stress domains ($p < 0.001$). In the work/private life conflict, an increase in the COPSOQ score of 1 was associated with a reduction in the WAI score. However, this association failed to reach statistical significance.

The results of the exposure of respondents to mobbing are presented in Table 10. For 7.16% of the respondents, the mobbing was carried out in the form of intimidation; hence, their recording indicates that mobbing is an integral part of negative psychosocial influence in the work process. There was no statistically significant difference between the number of threats made to low vision and control group respondents (Pearson test: $\chi^2 = 0.523$, $df = 1$, $p = 0.469$); however, for both groups of respondents, a risk of exposure to this and other types of mobbing and discrimination exists.

Table 10. Exposure to intimidation.

Respondent	Exposure to intimidation, *N* (%)		Total
	Yes	No	
Low vision	34 (7.55)	415 (92.22)	450
Control	9 (6.00)	141 (94.00)	150
Total	43 (7.16)	556 (92.67)	600

Note: Pearson test: $\chi^2 = 0.523$, $df = 1$, $p = 0.469$. Significant at $p < 0.05$.

4. Discussion

Recent assessments of the work ability of different categories of people depending on occupation indicate that the WAI can be used as an objective means to evaluate work ability and identify risk factors of reduced work ability. Moreover, the WAI is suitable for assessing the effects of the applied intervention program and suggesting measures for the elimination of unfavorable and risky work environment factors that adversely affect work ability. The WAI is also suitable as a valid identifier of applied preventive programs for the promotion of occupational health [12,17,22,24].

Vision impairment is an ophthalmologic condition that has multicausal etiology, has complex pathogenesis and can evolve into severe forms of damage and definite loss of vision, whereupon it becomes a handicap that affects not only the quality of life but also the ability to work [1].

People with vision impairment, in addition to other adverse effects, are exposed to continuous stress, unfavorable psychosocial conditions in all organizational stages of the work process, frequent mobbing and discrimination

during work, all of which reflect on their work ability and productivity [16,25].

In 34 low vision and nine control group respondents (7.16%), mobbing was conducted in the form of intimidation or another type of discrimination during work. Khoo et al. [26] stated that, during working hours, people with disabilities were very often under constant stress not only because of the particularities of their work but also because of the tendency to be very often discriminated against and marginalized by colleagues and their surroundings in general. Sanders [27] and Alavinia et al. [28], in similar investigations, emphasized the subjective, emotional and contextual characteristics of the personality of the disabled as an additional negative factor in their self-assessment of health and productive potentials. Both investigations are in accordance with our findings. Several previous investigations conducted with people from different professions indicated that work ability, in parallel with the function of eyesight, was affected by other factors. However, they do not fully clarify the complex relationships of specific individual characteristics and the intensity of perceptions of different relationships and actions, particularly psychosocial factors, in the work process [29].

The WAI scores of the low vision group, when compared with the scores of the control group respondents, were significantly different from the low vision/control groups in favor of the better work ability of control group respondents than those with low vision.

Comparisons of these WAI results with similar parallel scientific studies suggest that all respondents with low vision involved in our research obtained a significantly lower average WAI score than that obtained by respondents with similar sociodemographic characteristics but with preserved vision. Lavasani et al. [30], in a study carried out on 275 employees with various disabilities in Malaysia, claimed that 29.5% had poor work ability, 35.3% had moderate work ability, 28.7% had good work ability and 18% had excellent work ability.

We observed that respondents aged 20–50 years have better work ability when compared with subjects over the age of 50 years, with a statistically significant difference, including both low vision and control group respondents. In previous studies on different aspects of age and work ability, several authors refer to the existence of a negative correlation between work ability and age [31–34].

There was a statistically significant difference between the low vision and the control group male and female respondents in favor of the better work ability of male respondents when compared with female respondents. The WAI of male and female participants from the low vision group and the control group showed reduced scores with age, which, for male and female respondents over the age of 50 years, was statistically significantly lower when compared with the WAI scores of both genders aged younger than 50 years. Van den Berg et al. [35], in a study of the multifactorial etiology of the influence of WAI scores on professional employees from different occupations, suggested that male respondents have a higher WAI score by 2 index points (4%) when compared with female respondents. With regard to age, the WAI scores for employees over 40 years of age were considered to decrease by 4 index points (7.3%) when compared with younger employees. In their study, it is also evident that each of the psychosocial factors regarding gender have different unique variables of influence on work ability.

Rotenberg et al. [15] and Fernandes et al. [36] reported that for both men and women there were differences in the WAI scores in relation to gender, in that the WAI scores for female employees were lower in relation to men and that the vulnerable period in which there was a significant reduction in WAI scores of women was uniquely expressed in the age groups of 25–34, 40–44 and 60–64 years.

Using a Tukey *post hoc* analysis, we assessed the average WAI scores in relation to the level of education and professional orientation of all 450 respondents with low vision, and found a statistically significant difference in relation to laborers/office workers ($r = 0.003$) in favor of the better work ability of office workers; to laborers/farmers ($r = 0.005$) in favor of the better work ability of laborers; to laborers/others ($r = 0.004$) in favor of the better work ability of respondents from other professions; to office workers/farmers ($r = 0.001$) in favor of the better work ability of office workers; and to farmers/others ($r = 0.003$) in favor of the better work ability of respondents from other professions. Lavasani et al. [30] aimed at measuring the work ability of employees with a disability and reported that the WAI for employees with primary education was 28.92 ± 8.36, with secondary education was 30.99 ± 7.77 and with higher education was 41.11 ± 4.47. In similar research focused on the work ability of various categories of medical and nursing staff in hospitals, Habibi et al. [37] found that the WAI score was 38.25 ± 4.4 and that there were WAI variations regarding the level of education, qualifications and subprofessional specifications.

In a survey conducted with employees in commercial activities, Van den Berg et al. [35] noted that the average WAI score was 41.1 ± 5.1 and was greater than the average WAI of employees in mentally demanding jobs (reported average of 39 ± 4.2 as determined by Tuomi et al. [24]). Sjögren-Rönka et al. [38] also emphasized the negative impact of physical demands and stress factors on the work ability of office workers employed in various positions.

The influence of the psychosocial conditions of work environments on work ability in our study was assessed from 19 different aspects (domains), with univariate regression analysis. It was observed that for low vision and control group respondents, an increase in the COPSOQ score of 1 was associated with an increase in the WAI score with statistically significant difference ($p < 0.001$) in the domains of work importance, career prospects,

rewards/feedback, role and definition, quality of management, social support, job satisfaction and health status, which indicates that improved conditions related to these domains favorably influence an increase in work ability and that it is necessary to try to maintain or improve their existing gradient.

In the domains of quantitative demands, cognitive demands, emotional demands and exhaustion and stress, an increase in the COPSOQ score of 1 was associated with a decline in the WAI score with a statistically significant difference ($p < 0.001$). This result implies that people with low vision, particularly those with severe visual impairment, should take preventive measures and avail of programs that will enable its elimination. The measures taken will enable the improvement of work ability and health protection of people with low vision.

There was no significant impact of psychosocial factors on the WAI score in the domains of workplace duties, predictability, employee–superior relationships, fairness, reputation and work/family conflicts, although, depending on the domain, there was a negative/positive impact of the psychosocial conditions of the work environment on the WAI.

In the interim, there are very few reference reports that address the problem of work ability of people with impaired vision. Moreover, detecting crucial psychosocial determinants that play the role of predictor of work ability and identifying the gradient at which they have a positive or negative influence was challenging for us to try and contribute to the illumination of this complex and exact problem. Our research results were compared with the results of previous scientific studies conducted in different countries of the world and relating to the influence of psychosocial conditions on the WAI of other categories of healthy and disabled people from different professions. Van den Berg et al. [35] assessed the impact of psychosocial factors on employee health and work ability, and found that work ability was strongly associated with stress, the organization of work processes, physical demands of work, the individual mental perception of stress factors and the possibility of their balancing by employees.

Edwards et al. [39], in a study on the effect of psychosocial factors on the work ability of nurses, emphasized the importance of factors such as physical overload, employee/medical staff relationships and bureaucratic management in performing work tasks. Borritz et al. [40] also showed the effect of physical exhaustion and overload on individual potentials and managerial relationships in the work process.

5. Conclusions

Results from this investigation suggest the complicated influence of psychosocial aspects of work environments on the WAI of low vision and control group respondents.

Vision impairment in itself does not have a decisive importance in determining or assessing the WAI. However, there exists a significant correlation with the effects of psychosocial conditions of the work environment, such as the quantitative, qualitative and emotional demands of work; specificity of the type of profession; vocational training and education; exposure and intensity of stressors at work; general health condition and basic illnesses; individual personal traits; among other circumstances. Crucially, these are not merely related to the level of vision impairment, suggesting that other factors are perhaps at play.

Timely consideration and detection of the psychosocial factors of the work environment, which have a negative impact on the WAI, will enable adequate preventive measures to be taken for their elimination and will contribute to not only the improvement of work ability but also to preserving health over the long term and preventing disease from afflicting anyone involved in the work process, particularly those with vision impairment.

Disclosure statement

No potential conflict of interest was reported by the authors.

ORCID


Maja Belevska http://orcid.org/0000-0002-7063-8718

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