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Articles

Factors Associated with Work Ability in a Population of Dock Workers

Chiara Costa [1], Manuela Pollicino [2], Giusi Briguglio [2], Alessandra Verzera [2], Manuela Coco [2], Francesca Verduci [2], Giuseppe Lembo [3], Angela Alibrandi [4], Elvira Micali [2], Concettina Fenga [2]*

Abstract

Background: Work ability consists in the balance between employee's capabilities and work demands. It can be measured by the Work Ability Index, a validated questionnaire that has been used in Europe since 1980s. This study is the first evaluating work ability among dock workers, a workforce which carries out complex activities requiring physical and mental engagement (night shifts, irregular shifts, constant demand for attention and concentration and significant physical effort).

Objective: It was hypothized that the high strain level affecting this peculiar job may lead to a decrease in work ability. The aim of the study was to assess work ability and investigate if and how much not work-related factors, such as psycho-emotional state, lifestyle, health conditions and socio-demographic aspects, can interfere with it. Psycho-diagnostic protocol consisted of 6 questionnaires, chosen because of fast and effective data collection aiming to worker compliance and simple interpretation of results.

Method: A total of 105 workers was engaged in different companies involved in port services. A protocol consisting of 6 questionnaires has been applied individually before the work shift: Work Ability Index (WAI), Effort-reward imbalance questionnaire (ERI), Beck Depression Inventory-II (BDI-II), Hamilton Rating Scale for Anxiety (HAM-A), Epworth Sleepiness Scale (ESS), Pittsburgh Sleep Quality Index (PSQI).

Results: Work ability resulted excellent in 60 subjects and good in 37. No significant correlation between individual characteristics and work ability was found. Our results indicated that work ability was negatively related with emotional states, particularly with anxiety. Univariate and multivariate linear regression model for work ability, have shown a statistically significant correlation with BDI, HAM-A and ERI questionnaires' results.

Conclusion: Our results showed that WAI is a useful tool for routine occupational health surveillance. The association of work ability with psychosocial factors suggests that actions at the workplace adopted by occupational physicians in order to prevent a reduction in working capacity, should have a multidimensional approach evaluating not only individual lifestyle, but also mood states.

[1] Clinical and Experimental Medicine Department, University of Messina, Messina, Italy

[2] Department of Biomedical and Dental Sciences and Morphofunctional Imaging, Occupational Medicine Section, University of Messina, Messina, Italy

[3] Port System Authority of the Strait of Messina, Messina, Italy

[4] Department of Economics, University of Messina, Messina, Italy

E-mail corresponding author: manuelapollicino@gmail.com

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1. Introduction

Work ability can be described as "the sum of the factors that make it possible for a worker to profitably manage his work requests in a specific circumstance" (Bernburg et al., 2016). More recently it has been defined as "the balance between the employee's resources and the work demands" (Marklund et al., 2020).

The work ability can be measured by the validated work ability index (WAI) (De Zwart et al., 2002), a questionnaire conceived by the Finnish Institute of Occupational Health (FIOH), used since the early 1980s. Since then, WAI is being used as an appropriate instrument in order to estimate worker's overall capabilities and to determine its associated variables (Mazloumi et al., 2012). This index has been widely applied in occupational health surveys in order to identify workers and working environments that need supportive measures. Also, this tool can be helpful in adopting preventive strategies in different work settings: today, the WAI questionnaire has gained international application, and it is available in almost 30 languages. Scientific literature proved that WAI is an effective instrument in prefiguring long periods of absence from work due to illness and early retirement and recognizing prognostic factors for mortality and work disability (Bae, 2020).

At the state of the art, there seem to be two main objectives that scientific research aims with regard to work ability: the first is to identify the individual social and work-related conditions that can interfere with work ability. The second one is to find preventive strategies to improve the longevity of the workforce. This because the workforce is ageing. If on the one hand this reality may not be particularly decisive for sedentary professions, on the other hand, for workers involved in tasks that mainly require physical performance, finding strategies represents a challenge (Rothmore & Gray, 2019).

As work ability is determined by an individual's perception of the demands at work and the ability to cope with them, in the last few years, there has been an increasing interest in examining in depth the work ability in different workers categories, in order to identify individual characteristics related to lifestyle: body mass index, physical exercise time per week, smoking habit, drinking habit and age, even if the relationship with WAI is still controversial (Bridger & Bennett, 2011; Firoozeh et al., 2017; Kim et al., 2019). Additionally, some authors suggest that WAI scores are influenced by working conditions: employee's performance skills, poor autonomy, negative social climate, insecurity on the stability of occupation. Job strain can also negatively interfere with workers' adaptive resources, work adaptability, job satisfaction and motivation, causing an increase in absenteeism, more frequent turnover and early retirement. Previous observations demonstrate that these adverse elements may have consequences, firstly on developing of strain and stress, which in turn can have negative repercussions on physical and psychological health (e.g. musculoskeletal pain or chronic diseases such as hypertension,

diabetes and neurocognitive impairment) (Marklund et al., 2020). In particular, there are groups in which the risk may be higher, such as in "aging workers" and in some jobs requiring both mental and manual commitment, due to the natural decrease in adaptability to new job requests, and to the stressful potential of jobs that require both psychological and physical resources and irregular or night shifts.

In the last twenty years, European studies conducted especially in Scandinavian countries, have focused on the assessment of work ability for both genders using the WAI mainly on white-collars (office workers of public administration or employed in commercial activities) and healthcare workers (Jääskeläinen et al., 2016; Lindegård et al., 2014; Marklund et al., 2020; Van Den Berg et al., 2010). Studies conducted in non-European countries have also investigated workers employed in more manual activities (firemen, street cleaners, construction workers) (Bae, 2020; Bridger & Bennett, 2011; Ng & Chan, 2018; Rostamabadi et al., 2017). To the best of our knowledge, the present study is the first where work ability was assessed among dock workers, a category employed in both manual and intellectual demanding activities, investigating psychosocial factors and individual characteristics.

Dock workers belong to a workforce which carries out complex activities including also tugboat pilots and mooring assistants, performing their own activities in extremely difficult, often even dangerous conditions, requiring physical and mental engagement. Working by the sea in any weather condition, availability throughout 24 hours/day, irregular shifts and effort/commitment level/intensity due to frequently unpredictable work assignments, imply a demand for high flexibility both for workers and their family. This prolonged condition of intense strain in either personal and working sphere, can be overcharged by ageing and by the onset of health disorders either related to work and not. Moreover, a growing request for increased productivity which also involved workers employed in transport and trade activities, as dock workers, has led to an intensification in shift work. It is estimated that in the Western world about 10% of the workforce is exposed to night work, including permanent night shifts, night shift work or irregular shifts (Costa et al., 2020). The occurrence of irregular and unscheduled shifts can induce dock workers to adopt an unhealthy lifestyle characterized by inadequate diet, cigarette smoking, lack of physical exercise.

1.1 Hypothesis

Based on these premises, it was hypothized that the high strain level affecting this peculiar job (night shifts, irregular shifts, constant demand for attention and concentration, significant physical effort) may lead to a limitation of employees' work ability. Still, it is known that other factors, indirectly linked to work environment, are potential causes of reduced work ability.

Consequentially, the goal of this study was to assess work ability and investigate if and how much not work-related factors, such as psycho-emotional state, lifestyle, health conditions and

socio-demographic aspects, could influence it. A psycho-diagnostic protocol was proposed, consisting of 6 different questionnaires, each one dedicated to an aspect of each employee's life and health. This methodology was chosen with a view to fast and effective data collection, aiming to worker compliance and simple interpretation of results.

2. Method

2.1 Study design and study population

This was a cross-sectional, descriptive study, which was carried out at the port authority offices in the city of Messina, Italy from October to November 2019. A total of 106 workers was engaged in different companies involved in port services, operating in Messina harbour. Subjects participated in a voluntary program of health promotion implemented by port authority. Initially, a team composed of three well trained physicians and a psychologist attended the workplaces and explained the purpose of the study to all workers; after gaining the trust and obtaining the informed consent of those who were eligible, the participants were subjected to a battery of questionnaires in the time frame between 7.45 am and 12.00 pm, always before the start of work shift. As an inclusion criterion, workers had to have a minimum of 1-year working experience. The presence of psychiatric illnesses was an exclusion criterion, to avoid confounding effects.

Ethical approval has been gained by the Ethics Committee of University Hospital of Messina and carried out in accordance with the Declaration of Helsinki.

2.2 Sociodemographic, lifestyle, health and work-related factors

To evaluate these factors, a separate questionnaire designed by the researchers has been used during medical examination. Sociodemographic factors included age, gender, marital status, number of children and educational level; the last was categorized in two groups with less or more than 8 years scholar instruction.

Lifestyle and health-related factors included smoking, drinking habit, exercise activity, body mass index, systolic and diastolic pressure level.

Participants were divided into current smokers, non-smokers and previous smokers from at least 1 year. To distinguish moderate drinking from alcohol abuse, the consumption of ≤2 glasses of wine or beer per day or up to 3 servings of liquor per week was considered normal. Workers were also questioned about physical activities during leisure time through a single question: they were considered sedentary when they did not exercise for at least 30 min, twice a week, for over 1 year. The body mass index (BMI) was calculated by dividing body weight in kilograms by the square of body height in meters and used to define persons as normal (BMI <25 kg/m^2), overweight (BMI 25–30 kg/m^2), or obese (BMI >30 kg/m^2). To evaluate blood

pressure levels of each study participant, trained medical doctors registered a measurement from the right arm (passively supported at the reference level of the right atrium) while the subject was comfortably seated, between collection of anamnesis and submission of psycho-diagnostic questionnaires.

Work-related factors included work sector and specific task, job seniority in the same task, work schedule and night shifts, use of personal protective equipment and occupational injuries. Job seniority was registered as minor or higher than 20 years in the same occupational field.

2.3 Psychodiagnostic protocol

The psycho-diagnostic protocol has been applied individually in the same conditions before the work shift in anti-meridian time and after completing the anamnestic data collection form. Subjects were requested to complete the protocol in not more than 45 minutes after the explanation.

2.3.1 WAI questionnaire (WAI)

Questionnaire consists of seven items, including current work ability compared with the lifetime best [0–10], work ability in relation to the demands of the job [score range: 2–10], number of current diseases diagnosed by a physician [score range: 1–7], estimated work impairment due to diseases [score range: 1–6], sick leave during the past 12 months [score range: 1–5], personal prognosis of work ability 2 year from now [score range: 1,4, or 7], and mental resources [score range: 1–4]. The total score of WAI is calculated by summing up the scores of all items that ranged from 7–49 points. The final WAI score categorized into the following levels: poor [7–27], moderate [28–36], good [37–43], and excellent [44–49].

2.3.2 Effort-reward imbalance questionnaire – short Italian version (ERI)

Effort-reward imbalance (ERI) is one of the most used theoretical models to evaluate psychosocial factors in workplace. It is a standardized, self-report measure including items regarding effort (both physiologic and physical), reward (received in return to efforts spent at work including satisfactory economic treatment, appreciation and career advancement) and over-commitment. The model proposes that lack of reciprocity (high effort in combination with low reward) generates negative emotions and psychobiological stress responses with adverse long-term effects on health. This model is usually measured by a psychometrically validated questionnaire available in two comparable versions, an original version containing 23 Likert-scaled items and a short version containing 16 items measuring the two theoretical dimensions 'effort', and 'reward', and an additional personal factor 'over-commitment', in terms of uni-dimensional scales (Siegrist et al., 2014). There are currently two Italian versions of this questionnaire (Magnavita et al., 2012): long (22 items) and short (16 items).

The short version consists of three items measuring effort, reward and overcommitment. This model is a measurement of psychosocial work stress comprising 3 psychometric scales, effort, reward, and overcommitment. The scale 'effort' is measured by 3 items (ERI1-ERI3), the scale 'reward' by 7 items (ERI4-ERI10), and the scale 'overcommitment' by 6 items (ERI11-ERI16) using a 4-point Likert scaled answer format (strongly disagree, disagree, agree, strongly agree). A total score based on the three items measuring effort varies between 3 and 12. Reward is assessed in terms of tangible and/or intangible dimensions: money, esteem, status, control over promotion prospects, and job security and is measured by a sum score that varies between 7 and 28. Because the over-commitment questionnaire was already the result of a previous psychometrically validated reduction capturing the essence of this personal pattern of coping with work, it was included without further change into the short version. Average scores of these ratings were calculated and after normalization an effort/reward ratio was computed by dividing the 'effort' score by the 'reward' score, using the algorithm reported by Siegrist (Siegrist et al., 2014).

2.3.3 Beck Depression Inventory-II (BDI-II)

It is a self-report depression scale developed by Beck et al. to measure affective, cognitive, motivational, and physiological aspects of depression, and is widely used in both research and clinical settings (Arnarson et al., 2008). The BDI-II, published subsequently, introduced changes in domain and duration cues for measurement. The BDI-II consists of 21 items rated on a 4-point Likert scale from 0 to 3.A total score based on each of the twenty-one questions is obtained by counting the marked number to the right of each question (1-10 normal mood swings; 11-16 mild mood disturbance; 17-20 borderline clinical depression; 21-30 moderate depression; 31-40 severe depression; over 40 extreme depression). The highest possible total for the whole test would be sixty-three, the lowest possible score for the test would be zero. A score >17 can already be considered suggestive of depression.

2.3.4 Hamilton Depression Rating Scale (HAM-A)

It is a multiple item questionnaire used to provide an indication of anxiety (HAM-A) (Hamilton, 1959). The questionnaire is designed for adults and is used to rate the severity of their depression by probing mood, feelings of guilt, suicide ideation, insomnia, agitation or retardation, anxiety, weight loss, and somatic symptoms. The HAM-D contains 17 items, each one is scored on a 3- or 5-point scale and the total score is compared to the corresponding descriptor. Total score interval is 0-56, with ≤17 indicating mild, 18-24 mild-to-moderate, 25-30 moderate-to-severe and >30 severe symptoms.

2.3.5 Epworth Sleepiness Scale (ESS)

The ESS was validated in its Italian version by Vignatelli (Vignatelli et al., 2003). It is a multiple item questionnaire used to measure daytime sleepiness or average sleep propensity in daily life.

The ESS is a self-administered questionnaire with 8 questions. Respondents are asked to rate, on a 4-point scale (0-3), their usual chances of dozing off or falling asleep while engaged in eight different activities. The ESS score (the sum of 8 item scores) can range from 0 to 24 (0 no chance of dozing; 1 light chance of dozing; 2 moderate chance of dozing; 3 high chance of dozing). The higher the ESS score, the higher is the person's average sleep propensity in daily life, or their "daytime sleepiness" (0-7: unlikely abnormally sleepiness; 8-9: average amount of daytime sleepiness; 10-15: excessive sleepiness depending on the situation; 16-24: seeking medical attention should be considered). A score ≥10 can already be considered suggestive of depression, ≥16 of severe daily sleepiness.

2.3.6 Pittsburgh Sleep Quality Index (PSQI)

The quality of sleep was measured using the PSQI, in Italian, as translated by De Gennaro (De Gennaro et al., 2004). It is a self-report questionnaire that assesses sleep quality over a 1-month time interval. Consisting of 19 items, the PSQI measures several different aspects of sleep, offering 7 component scores and one composite score. The component scores consist of subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency (i.e., the percentage of time in bed that one is asleep), sleep disturbances, use of sleeping medication, and daytime dysfunction. Each item is weighted on a 0–3 interval scale. The global PSQI score is then calculated by totaling the seven component scores, providing an overall score ranging from 0 to 21: the highest possible total for the whole test would be sixty-three, the lowest possible score for the test would be zero.

2.4 Statistical Analysis

The categorical variables were expressed as absolute frequencies and percentages; numerical variables such as mean, standard deviation, minimum and maximum. The non-parametric approach was used for the analysis of the data since the examined variables are ordinal data represented by scores obtained following the administration of questionnaires. In order to assess the existence of possible interdependence relationships between the different questionnaires and also between items of the questionnaires and socio-demographic variables, the Spearman correlation test was applied. In order to identify possible significant predictors of work ability, univariate models have been estimated, in which the response variable is represented by the WAI scores, while the independent variables (potential predictors) are: BMI, age, working seniority, educational level, smoking habit, alcohol consumption, physical exercise, systolic and diastolic blood pressure values, work accidents, BDI, HAM-A, ESS, PSS and ERI. Finally, the multivariate model was estimated using the Stepwise procedure, simultaneously taking into consideration all the variables indicated above, in order to identify independent predictive factors of work ability.

The statistical analyzes were carried out with the SPSS for Window software version 22, considering a significance level of 5%.

3. Results

3.1 Population characteristics

Socio-demographic factors resulting from the compilation of the data collection form are summarized in Table 1.

Table 1. Characteristics of study population (N=105)

	n	(%)
SOCIODEMOGRAPHIC FACTORS		
Age		
26-45	52	(49.52)
>46	53	(50.48)
Marital status	82	(78.09)
Children	78	(74.28)
Educational level (years)		
≤8	48	(45.71)
>8	57	(54.29)
LIFESTYLE AND HEALTH FACTORS		
Smoking habit		
No smokers	43	(40.95)
Smokers	42	(40.0)
Ex-smokers	20	(19.05)
Moderate alcohol consumption	55	(52.38)
Physical exercise		
Yes	40	(38.1)
No	65	(61.9)
Body Mass Index (BMI, kg/m^2)		
18-24 (normal weight)	38	(36.19)
25-30 (overweight)	67	(63.81)
>30 (obese)	0	(0)
Blood pressure		
Systolic ≥140 mmHg	28	(26.67)
Diastolic ≥90 mmHg	31	(29.52)
WORK-RELATED FACTORS		
Seniority (years)		
≤20	33	(31.43)
>20	72	(68.57)
Night shifts	79	(75.24)
Work accidents	28	(26.67)

Workers were stratified by age: 52 individuals (49.52%) were placed within the range between 26 and 45 years, 53 subjects (50.48%) were older than 46 years. Furthermore, the subjects were divided on the basis of working seniority (≤20 years and >20 years), with a percentage respectively of 31.43% (33 workers) and 68.57% (72 workers).

A number of 106 subjects, all male, were enrolled to conduct this study. One of these has been excluded because of neuro-psychiatric pathology, to avoid confounding factors. On a total of 105 workers included in the study, 78.09% of the subjects (82 individuals) were married, with a percentage of 74.28% (78 subjects) with children. As regards schooling degree, 45.71% had a school graduation, compared to 54.29% of subjects with less than 8 years of scholar education. 75.24% of workers currently worked night shifts. Each worker carried out night shift once a week from 10 p.m. to 6 a.m.

Regarding lifestyle habits (Table 1), it has been shown that 52.38% (55 workers) consumed a moderate amount of alcoholic beverages and 40% (42 subjects) were actual smokers. Health-related issues are also described in Table 1. Considering a BMI value ranging from 18-24 (normal weight), 67 (63.81%) subjects were found were found to have a BMI >25; no obese subjects were present in this population. Measurement of blood pressure showed that 26.67% of workers (28 individuals) had systolic blood pressure values ≥140 mmHg, while 29.52% (31 subjects) had diastolic pressure values ≥90 mmHg.

Finally, only 26.67% (28 individuals) reported having had work accidents. All subjects were requested to perform similar tasks and used adequate personal protective devices.

3.2 Psychodiagnostic evaluation

As described in Table 2, WAI results showed that the working capacity was poor (score 7-27) in no subject, moderate (score 28-36) for 7.6% (8 subjects), good (score 37-43) for 35.3% (37 subjects) and excellent (IV percentile, score 44-49) for 57.1% (60 subjects) of workers.

Table 2. Work Ability Index score distribution in a population of 105 dock workers

WAI classes	24-35 years (n=23)	36-45 years (n=29)	46-55 years (n=34)	56-65 years (n=19)	% (n)
Excellent *(score 44-49)*	13	17	21	9	57.1 (60)
Good *(score 37-43)*	9	10	9	9	35.3 (37)
Moderate *(score 28-36)*	1	2	4	1	7.6 (8)
Poor *(score 7-27)*	0	0	0	0	(0)
Mean±SD	43.9±4.1	44.2±4.1	43.2±5.7	43.5±3.5	105

The psychosocial occupational stress was assessed with the model and measuring instrument Effort-Reward Imbalance (ERI) developed by Siegrist, the results (Table 3) showed a low mean

effort (4.7 on a 3-12 range) and a high mean reward level (22.0 on a 7-28 range). Thus, the ERI ratio, as a value for the proportion between work effort and work-related reward, was used as an index for the psychosocial occupational stress; it was thus far below the cut-off value of 1 (0.56±0.38, mean±SD), and it was confirmed by a scarcely perceived overcommitment (9.2±3.6, mean±SD on a 6-24 range).

Table 3. ERI score in a population of 105 dock workers

ERI factors	Mean±SD
Effort *(score 3-12)*	4.7±2.2
Reward *(score 7-28)*	22.0±5.0
E/R *(score 0.25-4)*	0.56±0.38
Overcommitment *(score 6-24)*	9.2±3.6

Table 4 reports mean ± SD of scores obtained from submission of psychodiagnostics protocol. The BDI results showed that only 3.8% of workers (4 subjects) had mild mood disorders (scores between 1 and 10); the remaining 96.19% (101 subjects) had values within the normal range (scores between 11 and 16). Yet, the results of the HAM-A revealed that all subjects (100%) had minor anxiety disorders (I tertile score <17).

Table 5. Correlation between psychodiagnostic tests score

	WAI	BDI	HAM-A	ERI	PSQI	ESS
Work Ability Index	1					
Beck Depression Inventory	r= -0.156 p= 0.112	1				
Hamilton Anxiety Rating Scale	r= -0.405 **p <0.0001**	r= -0.633 **p <0.0001**	1			
Effort-Reward Imbalance	r= -0.152 p= 0.122	r= -0.252 **p= 0.009**	r= -0.127 p= 0.196	1		
Pittsburgh Sleep Quality Index	r= -0.167 p= 0.089	r= -0.300 **p= 0.002**	r= -0.374 **p <0.0001**	r= -0.093 p= 0.347	1	
Epworth Sleepiness Scale	r= -0.176 p= 0.073	r= -0.194 p= 0.048	r= -0.333 **p= 0.001**	r= -0.010 p= 0.919	r= -0.378 **p <0.0001**	1

Instead, as shown in Table 5, there is a positive correlation between HAM-A and BDI (rs=0.633; p<0.001) and also between ERI and BDI (rs=0.252; p=0.009). ESS is negatively correlated with WAI (rs=-0.176; p=0.073, tendency to significance) and positively correlated with the PSQI (rs=0.378; p <0.001), with the BDI (rs=0.194; p=0.048) and with the HAM-A (rs=0.333; p=0.001). The ESS also correlates positively with the BMI (rs=0.223; p=0.022).

Few subjects demonstrated sleep disorders evaluated by PSQI, which showed a mean global score of 3.9±3.6 (0-13). Considering a score ≥5 as suggestive of sleep disorders, 39/105 (37.1%) subjects of our population resulted positive; however, only 4/105 (3.8%) workers presented a

PSQI global score >10, while the majority had only mild sleep disturbance. Also 10/105 subjects (9.5%) reported, along with PSQI score ≥5 (r=0.378), an ESS global score ≥9 indicating daytime sleepiness.

The PSQI is directly related to the BDI (rs=0.300; p=0.002) and with the HAM-A (rs=0.374; p<0.001). The same questionnaire is significantly and positively correlated both to the registry age (rs=0.194; p=0.047) and to working seniority (rs=0.312; p=0.001).

The BDI results are positively and significantly correlated to working seniority (rs=0.233; p=0.017) but not to the registry age, exactly in analogy to what happens for the HAM-A (rs=0.210; p= 0.031).

Finally, as shown in table 6, also the results of univariate and multivariate linear regression model for Work Ability, compared to multi-independent variables, have shown a statistically significant correlation with BDI, HAM-A and ERI questionnaires' results. Conversely, no correlation was found between work ability and the following individual and work-related factors: age, BMI, systolic blood pressure, diastolic blood pressure, sleep quality (PSQI), sleepiness (ESS), smoking habit, alcohol consumption, drugs, educational level, work seniority, shift-work, work accidents.

Table 6. Results of univariate and multivariate linear regression model for Work Ability

INDEPENDENT VARIABLES	**UNIVARIATE MODELS**			**MULTIVARIATE MODEL**		
	B	95%C.I.	p-value	B	95%C.I.	p-value
Age	-0.031	-0.140; 0.079	0.581	0.003	-0.143; 0.144	0.998
BMI	-0.001	-0.280; 0.277	0.993	-0.021	-0.311; 0.270	0.888
Work seniority	-0.029	-0.134; 0.077	0.592	0.069	-0.059; 0.197	0.285
Educational level	0.177	-0.193; 0.548	0.345	0.234	-0.160; 0.627	0.241
Shift-working	1.600	-0.872; 4.071	0.202	1.421	0.852; 3.695	0.218
Smoking habit	0.628	-0.822; 2,077	0.392	0.737	-0.619 2.094	0.283
Alcohol consumption	-0.040	-2.193; 2.113	0.971	0.543	-1.580; 2.665	0.613
Drugs	-0.841	-3.151; 1.470	0.472	0.731	-0.598; 2.060	0.477
Systolic blood pressure	-0.025	-0.088; 0.038	0.436	0.054	-0.033; 0.141	0217
Diastolic blood pressure	-0.077	-0.169; 0.015	0.099	-0.075	-0.202; 0.051	0.240
Work accidents	-1.896	-4.299; 0.507	0.121	-1.421	-3.713; 0.871	0.221
BDI	-0.185	-0.512; 0.142	0.265	0.565	0.125; 1.005	**0.012**
HAM-A	-0.516	-0.776; -0,257	**0.001**	-0.848	-1.225; -0.471	**0.001**
ESS	-0.211	-0.545; 0.122	0.212	-0.014	-0.383; 0.356	0.941
PSQI	-0.172	-0.513; 0.169	0.320	0.068	-0.306; 0.441	0.720
ERI	-0.240	-0.409; -0.071	**0.006**	-0.312	-0.488; -0.135	**0.001**

4. Discussion

The present study evaluated work ability, measured by WAI, in a population of dock-workers; psychosocial factors and individual characteristics were also investigated.

In our case, the main finding was represented by high WAI values: in fact, work ability resulted excellent in 60 subjects and good in 37 (92.4%, mean overall WAI score 43.7±4.5).

Work ability is usually interpreted as the capacity to complete a certain task; among workers the work ability measures how effectively a worker has the potential to get his or her job. Although a common definition of work ability does not yet exist in the scientific literature, work ability often encompasses physical, mental and social resources. The whole concept can be divided into generic working capacity and specific working capacity. Possessing work ability in a generic sense consists in being healthy and having basic skills and qualities required to complete some form of work, assuming that requests are reasonable and that the work environment is acceptable. Possessing work ability in a specific sense means having a certain number of manual, physical and social skills together with a good state of health and the distinctive work-specific skills needed to handle the requests that depend on the qualification and function of each worker (Alavinia et al., 2009; Emberland & Knardahl, 2015; Fadyl et al., 2010; Kujala et al., 2006; Reeuwijk et al., 2015; Serra et al., 2007; Shaw et al., 2003; Von Bonsdorff et al., 2011).

Actually, several European countries try to manage the shortage of specific professional figures essential to society, due to several factors, particularly the age of the population, the employee's early retirement and the inefficient replacement with youger employees, frequent absences from work due to work-related illnesses or to occupational stress (Lima et al., 2016). It is easy to think that aging is the cause of the decrease in work ability as a consequence of fewer physical and mental resources and for the onset of pathological health conditions such as cardiovascular and musculoskeletal diseases (Makowiec-Dąbrowska et al., 2008). Through the WAI questionnaire, it is possible for each worker to evaluate their own working capacity given by the relationship between both physical and mental work demands and their state of health from which can be deduced the capability to take work decisions and the degree of functioning in specific organizational and social conditions. WAI allows to evaluating and quantifying the workers' resources in order to predict the subjects' response to the current and future workload and to identify the physical and mental resources to overcome the work-related struggle (Makowiec-Dąbrowska et al., 2008). For this reason, it would be essential to identify the factors that directly or indirectly influence the work capabilities. Consequently, WAI also represents a tool for the employers monitoring the working capacity of their employees over time but also to diagnose and implement corrective actions in the workplace, including the promotion of healthy lifestyles and an adequate training for the management of occupational risks (Abbasi et al., 2017; Silva et al., 2016). In particular, Bugajska et al. (2011) and Heyman et al. (2018) underlined that older

workers are more sensitive to night shifts, irregular shifts, longer shifts, exposure to risk agents, heavy physical effort and the variability of the workplace. If the employer modifies these risk factors, it can have a positive effect on maintaining high working skills (Rypicz et al., 2021).

Scientific evidence shows that questionnaire subjected workers who reach low or medium WAI scores, present a significant risk of premature death, long periods of absence from work with consequent large economic State support, due to the greater use of services of rehabilitation. Large high-quality cohort studies using the WAI started since 1980s in Scandinavian countries and the Netherlands to verify if this questionnaire was able to indicate the workers at greatest risk of permanent diseases. The introduction of a multidisciplinary health promotion program including the prevention and management of issues relating to subjective well-being, has proved effective. The results have shown over time that WAI can be used as an effective prognostic tool to identify the workers at greatest risk who need multidisciplinary assistance, and requires a screening phase and a clinical history to identify the needs of the participants subjected to the questionnaire.

A comprehensive approach includes education about healthy lifestyle and introduction of real improvement interventions, workers attention to their own health conditions, together with a correct work organization and an early access to rehabilitation treatments, especially in the presence of particular pathological conditions such as muscle-skeletal and cardio-vascular disease (Bethge et al., 2021; Ćwirlej-Sozańska et al., 2020; Gutenbrunner et al., 2021).

In the past, other types of work-related stress have been investigated with different diagnostic protocols. Among these, burnout has attracted the attention of researchers (Maslach & Leiter, 2016) also in this case, the factors that can contribute to the onset of Burnout were highlighted. Many of these are the same determinants that affect work ability: age, gender, marital status, children, educational level, work environment and work organization (Caruso et al., 2014; Maslach & Leiter, 2016).

Regarding the correlation between WAI and socio-demographic and lifestyle factors, many observational and review studies demonstrated that WAI can be affected by BMI, physical exercise time per week, smoking and drinking habit (Firoozeh et al., 2017; Van Den Berg et al., 2010). Many scientific studies have shown that working capacity can be affected by numerous confounding factors (Bergman et al., 2020).

However, we did not establish such association. Earlier studies also associated gender, age, job seniority, marital status as well as educational level with reduced work ability, but we did not find this relation. Therefore, our results have shown that, in disagreement with most literature data, work ability was not significantly associated with the socio-demographic and lifestyle factors described in this population.

The characteristics of dock work and the complexity of tasks, in association with management and support from co-workers and supervisors, nature and strength of job demands, and degree of autonomy and participation of employees in decision making about the work process, might lead to job dissatisfaction, distress and illness, manifested as sickness absenteeism, presenteeism, mental disorders and job burnout (Fenga et al., 2009; Kim et al., 2020). For this reason, we also investigate the relationship between stress and psychosocial and organizational factors using the Effort-Reward Imbalance scale, that is an internationally acknowledged tool based on the notion of perceived job dissatisfaction as the origin of occupational stress and its negative effects for workers' physical and mental health. Job dissatisfaction is the result of imbalance between effort and commitment to work; in other words, of the workers' belief that rewards are not proportionate to their work (Siegrist et al., 2014). In this study a low level of occupational stress was found with this model, suggesting an optimal balance between work demands and employee's resources. This result can be explained by the reward appearing adequate: in fact, even if dock workers are required to assume higher work volume, they feel to receive comparatively high gratification in return to their efforts, including satisfactory economic treatment, appreciation and career progress.

The whole population presented low anxiety levels, whereas only 4/105 workers (3.8%) showed mild depressive disorder. This data appears particularly relevant, when considering that a in recent study among the U.S. workforce, the prevalence of major depressive disorder has been estimated at 7.6% (Schramm et al., 2020).

In agreement with existing literature (Haufe et al., 2020; Van Den Berg et al., 2010), our results indicated that work ability was negatively related with emotional states, particularly with anxiety ($p<0.0001$) measured by HAM-A. Based on this, it is possible to confirm that depression, anxiety and stress may influence employees' work ability.

There has been wide investigation on the relationship between mood or mental health disorders and aspects related to organizational features and workplace setting such as night shifts, long and irregular working hours, decision making under time pressure, the requirement of effective team-working and high mental requirement, performing complex skills in critical situations like unpredictable events. As all of these are typical characteristics of dock workers'commitment, they may potentially affect psychophysical health of this population (Berglund et al., 2021).

5. Conclusions

Upon these premises, it is obvious that inadequate sleep, as a consequence of night shift work and irregular working hours, may in turn cause chronic fatigue and decreased level of consciousness and an increased risk of injury (Åkerstedt et al., 2004) and these factors will eventually lead to impairment of working ability. Many studies – principally carried out among

health care employees which by definition are workers subjected to irregular and night shifts – have shown reduced work abilities in shift workers compared to non-shift workers (Cotrim et al., 2017). Though night shifts of these dock workers were irregularly scheduled and occurred as frequently as 1/week, contrary to our expectations in this study only few subjects (9.5%) demonstrated sleep disorders along with daytime sleepiness and it was not highlighted a significant association between these disturbances and work ability as in literature (Hurlston et al., 2019; Lieberman et al., 2013; Van Dongen, 2006); nevertheless, in agreement with recent research (El Hangouche et al., 2018), an inverse trend among WAI, PSQI and ESS score was observed.

To our knowledge, the present study is the first to evaluate work ability among dockworkers. Findings showed a higher mean WAI score for these workers when compared with values reported from other studies for employees which perform tasks which are predominantly physical or a combination of physical and mental demands (Mazloumi et al., 2012). This outcome is probably due to the favorable balance between effort and reward and to positive perception of workplace environment.

The significant association found between occupational stress, anxiety and work ability, as measured with ERI, HAM-A and WAI respectively, underlines that work ability much depends on individual coping resources but also on the psychosocial work environment, in terms of conditions related to job strain on one hand and to the reward system on the other, provided as quality of relationships, economic consideration, career progression.

6. Limitations and Strength

Therefore, even if our study has not shown a statistically strong association between work ability and sociodemographic or lifestyle aspects, we agree with the existing literature that WAI -when combined with other psychodiagnostic tools- has a good efficiency in highlighting workers and working environments that need supportive measures due to adverse conditions. In fact, the evident association of work ability with psychosocial factors suggests that actions at the workplace adopted by the occupational physician in order to prevent a reduction in working capacity, should address not only individual lifestyle promotion and work environment, but also emotional states.

The present study has some limitations that should be acknowledged. The cross-sectional design and therefore its inability to show the effects of different factors over time was one of its defaults. The WAI, a questionnaire structured as self-reported answers to a single question, does not examine the boundaries of each category (e.g. there is the possibility of unawareness of diseases) and this consequently may limit conclusion regarding causality. Moreover, workers participated to the study on a voluntary basis and data regarding the non-respondents were not

available, configuring a possible selection bias. Another limitation may be the unequal distribution between genders owing to the lack of female workers in study population, due to the scarce presence of women in this job field.

Nonetheless, a strength of our study was the use of validated screening questionnaires for calculating WAI score as well as the other psycho-diagnostic outcomes. In addition to scientific purposes, the uses of the WAI in the daily practice of occupational health care have also been recognized. It can be applied by occupational physicians as a simple instrument to assess individual work ability in periodic health surveys, or to measure work ability with associated factors at department or company level in workplace surveys (De Zwart et al., 2002). Based on the results of these surveys, the occupational physician may determine which job health measures are needed to promote or maintain individual work ability.

Conflict of Interest Statement

The authors declare that the research was conducted in the absence of any potential conflict of interest.

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