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Work Ability, Work-Related Health, and Effort–Reward Imbalance: A Cross-Sectional Study among University Staff during the COVID-19 Pandemic in Thailand

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Abstract: During the COVID-19 pandemic, university policies and public health measures resulted in university staff facing hazardous work environments and psychological health problems. This cross-sectional study aimed to analyze the association between sociodemographic characteristics, health conditions, work-related health, effort and reward imbalance (ERI), and work ability among university staff in southern Thailand. Data were collected using stratified random sampling of 381 participants between April and September 2022. Descriptive statistics and binary logistic regression analyses were used to examine the associations between the variables. The majority of the participants were female (63.5%) and aged below 45 years old (52%). Nearly 70% of the participants reported the absence of non-communicable diseases (NCDs), while half of them were overweight, and 54.9% had an effort–reward ratio (ERR) greater than one. Most participants reported good-to-excellent work ability (82.4%). The probability of having poor-to-moderate work ability was higher among staff working from home (adj. OR = 2.4; 95% CI: 1.3, 4.6), those with NCDs (adj. OR = 3.5; 95% CI: 2.0, 6.4), those who followed poor health behaviors (adj. OR = 2.6; 95% CI: 1.4, 4.9), and those who had an ERR greater than one (adj. OR = 2.8; 95% CI: 1.5, 5.6). In conclusion, the majority of university staff in southern Thailand had good-to-excellent work ability. Work ability was associated with the presence of NCDs, poor health behavior, working from home, and ERI. Therefore, universities should create suitable occupational health programs and resources to mitigate the negative effects of work conditions, including ERI, and promote healthy behaviors for their staff during the COVID-19 pandemic and future disasters.

Keywords: work ability; work-related health; effort–reward imbalance; university staff; COVID-19 pandemic

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1. Introduction

Higher education staff play a crucial role in shaping intellectual, personal, and professional development in colleges and universities. There are many factors that can contribute to the challenges faced by university teachers and support staff, including the need to stay up to date with modern research approaches, teaching methods, and academic development. Teaching staff, in particular, may also be faced with organizational and administrative challenges, including dealing with budget constraints, navigating complex university policies, and managing their own time and workloads (Heath 2016). It is important for teaching

staff to be aware of these new challenges and to create strategies to overcome the difficulties they encountered during the COVID-19 pandemic. These changes were accompanied by work intensification, job security issues, poor quality of work, and wage inequalities in a highly competitive education setting. There are various factors that can cause these problems, such as having no professional commitment, feeling dissatisfaction with the education system or working conditions, and taking heavy workloads (Matthews et al. 2022).

The COVID-19 pandemic presented many challenges and uncertain situations for teachers at all levels of educational institutes. The sudden shift from onsite teaching platforms to online teaching and learning approaches caused stress among university teachers because these approaches require new teaching modalities and technology programs. All academic staff must be ready to adapt themselves to gain more knowledge and attend training skills at all times with limited time to prepare in advance (Matthews et al. 2022; Minihan et al. 2022). Importantly, this changed the workload and stress because they had to manage the demands of teaching as well as provide students with support remotely throughout the pandemic period. Work stress can have a negative impact on employees' abilities to perform their jobs, and it may affect their overall health. High levels of stress can decrease academic productivity and increase absenteeism and burnout syndrome. It can develop into physical and mental health illnesses in the long term, including cardiovascular disease, depression, and anxiety (Griep et al. 2015; Schmidt et al. 2018; Selander et al. 2022). People with high levels of work stress may experience resting and sleeping difficulties and a lack of energy and motivation to continue working. The recognition of the challenges and difficulties faced by university employees during disaster constraints and the provision of necessary support and concern regarding appropriate workload, health, and work–life balance are imperative for university administrators.

A model that encompasses the aspects of work–life balance and employee health is the effort–reward imbalance (ERI), which can be used to understand the relationship between the effort that employees put into their work and the rewards they receive in return. The model is based on equity theory, which posits that people have an inherent desire for fairness and will seek to maintain a balance between their inputs (effort, time, and skills) and their outcomes (pay, recognition, and opportunities for advancement) (Siegrist 1996). When this balance is perceived to be unfair or imbalanced, employees may experience stress and dissatisfaction with their current work, which can lead to negative outcomes. They may encounter symptoms of burnout, turnover intentions, reduced job satisfaction, and adverse health effects (Siegrist et al. 2004; Kivimäki et al. 2006; Sanderson and Andrews 2006; Stansfeld and Candy 2006; Nieuwenhuijsen et al. 2010; Bethge et al. 2012). Moreover, the ERI model can offer options to promote work ability at the individual, interpersonal, and organizational levels (Siegrist 2005; Bethge and Radoschewski 2012). Recent studies have demonstrated that ERI is associated with work ability, as measured by the Work Ability Index (WAI) (Bethge et al. 2009; Bethge et al. 2012). The WAI is a tool used to assess an individual's work ability in relation to their current work and health status (Ilmarinen et al. 1991; Ilmarinen 2009). Individuals who experience high levels of ERI tend to have lower work ability scores on the WAI and may be at a greater risk of developing health problems or experiencing a decline in work performance (World Health Organization (WHO) 2011; Bethge et al. 2012). The relationship between ERI and work ability can be leveraged for the enhancement of work conditions and occupational health. This knowledge can assist individuals and organizations in recognizing the potential adverse effects of an excessive workload on health and well-being. A study on the association between ERI and work ability, and thus correlated to the concept of Quality of Work Life (QWL), investigated issues such as the balance between jobs and people in modern work life, which also requires the improvement of working conditions, job satisfaction, productivity, and social balance (Ertürk 2022).

The COVID-19 pandemic has had significant impacts on the education sector around the globe, including in Thailand (Rumakhom and Phatcharrachiraphan 2022). Universities adopted all tasks to remote and online learning platforms very quickly, and this turned

out to be a challenging task for both teachers and students. The unexpected shift to online platforms can create an imbalanced effort that teachers have to put in to deliver high-quality education and the reward they expect to receive from their efforts. This can produce occupational burnout and job dissatisfaction among teachers and other academic staff, which can impact their ability to produce effective work and maintain their health. In addition, the insufficient social interactions and support for these colleagues during social distancing measures may further reduce the work ability of the staff. These challenges can negatively influence university staff well-being and job satisfaction, which in turn can affect the quality of education and the productivity of the workforce.

The current literature reveals a paucity of research on the subject of QWL, including occupational health status among university staff in developing countries. Specifically, the impact of volatile situations, such as competitive educational challenges, limited working conditions, and psychological work constraints during the COVID-19 pandemic, have not been extensively studied in this population (Kyrönlahti et al. 2022; Matthews et al. 2022; Minihan et al. 2022). Given the constraints on operational resources brought about by the COVID-19 pandemic in Thailand, to what extent do the health status, work environment, and mental well-being of university staff influence their work ability? Thus, it would be valuable to conduct studies on the concept of QWL among university staff, using the ERI model, and its impact on work ability during the COVID-19 pandemic. The objective of our study was to analyze the health conditions, work-related health, ERI, and their influence on work ability among university staff in southern Thailand during the COVID-19 pandemic. Through this investigation, universities and other educational organizations can enhance their understanding of the challenges faced by their staff members and develop occupational health strategies to foster high-quality work–life environments during and after the pandemic.

2. Materials and Methods

2.1. Study Design and Participants

This study employed a cross-sectional design involving 26 universities in southern Thailand. The study population included 21,561 university staff. The sample size of 377 was calculated using the finite population proportion formula with $p = 0.5$; an adjustment to ensure an additional 5% of the study population yielded a sample size of 415 (Cochran 1977). Stratified random sampling proportional to the size of each university group was used to select the participants (Suresh et al. 2011). Overall, 381 university staff provided valid responses (for an effective response rate of 91.8% of the total 415).

2.2. Data Collection and Measurements

We used a five-part questionnaire that was developed by the researchers to collect information, including sociodemographics, health conditions, work-related health, working environment, work effort and reward, and work ability. The index of item objective congruence (IOC) yielded a value of 0.73–0.91 for content validity.

In this study, online questionnaires were distributed to research participants through the head of the human resources department in the selected university. The questionnaire could be completed from either the workplace or from home, depending on the working conditions established by the university. Data collection occurred during the COVID-19 outbreak, necessitating measures to enable most university staff to work from home (WFH). The questionnaire took approximately 15 min to complete. We analyzed the outcomes of individual online questionnaires by implementing a restriction that required respondents to complete the questionnaire only once via the questionnaire system.

2.3. Sociodemographic Characteristics, Health Conditions, and Work-Related Health

The sociodemographic characteristics examined included university type, gender, age, marital status, educational status, and primary position.

Health conditions included non-communicable diseases (NCDs) status (the presence or absence of ongoing treatment diseases such as cardiovascular diseases, diabetes, chronic respiratory diseases, chronic renal diseases, or cancer) and Body Mass Index (BMI) (BMI $\leq$ 22.9 kg/m^2 was normal or underweight; BMI $\geq$ 23.0 kg/m^2 was overweight or obesity) (WHO Expert Consultation 2004), including four items of health-related behaviors that covered regular exercise, balanced diet, obtaining enough sleep, and annual health check-ups.

Work-related health was comprised of working conditions and environments, including working duration, work hours, and income. Safe working environments were also explored with five items, namely, physical conditions, work-stations, facilities, and COVID-19 prevention measures at the workplace. A typical five-point Likert scale was applied to health-related behaviors and work environment assessment using the following responses: (5) strongly agree; (4) agree; (3) neutral; (2) disagree; and (1) strongly disagree.

2.4. Work Ability Index

Work ability index was developed by the Finnish Institute of Occupational Health Research and assessed using the Work Ability Index (WAI). This self-reported instrument combines a subjective assessment of an individual's ability to cope with the physical and psychosocial demands of work with information about diagnosed diseases, functional limitations, incapacity for work, and mental resources. Overall, work ability assessment can help to ensure that individuals are able to work safely and effectively while also promoting their overall well-being and quality of life (Tuomi et al. 2001; Ilmarinen 2007). The WAI is calculated by summing the scores of its seven items (range 7–49). The WAI is classified into poor (7–27), moderate (28–36), good (37–43), and excellent (44–49) levels (Ilmarinen 2007). The WAI questionnaire was translated into the Thai language for the assessment (Kaewboonchoo and Ratanasiripong 2015). To analyze the impact of independent variables on different domains of the WAI, we combined the seven items of the WAI into three domains according to the purpose of the WAI, as has been performed in other research (Ilmarinen 2007; Martinez et al. 2009; Han et al. 2014). These domain classifications considered work demands as follows: (1) perceived work ability—items 1, 2, and 6; (2) health status—items 3, 4, and 5; and mental resources—item 7.

2.5. Effort–Reward Imbalance (ERI)

ERI is a psychological concept that refers to the perception of an unequal balance between the amount of effort an individual spends on their work and the rewards they are given. ERI is believed to be a significant risk factor for the development of psychological distress, especially burnout, and job stress (Siegrist 1996; Siegrist et al. 2004). This information can then be used to make changes that better align effort and reward, focusing on providing additional resources or support or adjusting workload expectations. In addition, assessment can be used to evaluate the effectiveness of interventions aimed at reducing ERI. Three of the items assess the efforts invested, while seven of the items measure the rewards obtained in terms of esteem (2 items), job security (2 items), and salary and job promotion (3 items). Participants responded to the items on a four-point Likert scale (1 = strongly disagree, 4 = strongly agree). In order to assess the degree of imbalance between high cost and low benefit at work, an ER ratio (ERR) was calculated as E/(R*C), where E is the total score of the effort dimension, R is the total score of the reward dimension, and C is the correction coefficient based on the difference in the number of numerators and denominators (Siegrist et al. 2014). Here, C = 3/7 = 0.4286. An ERR value of >1.0 implies that efforts are higher than rewards and indicates that the amount of effort is not rewarded adequately, i.e., there is an ERI (Cavanagh 1992; Ge et al. 2021). We applied 10 items from an ERI questionnaire translated into Thai (Buapetch et al. 2008) based on the short form of the effect–reward imbalance questionnaire for the assessment (Siegrist et al. 2014).

2.6. Statistical Methods

Both descriptive; mean, standard deviation (SD), percentage (%), and inferential statistics were performed using SPSS version 23.0 (IBM Singapore Pte Ltd., Singapore) for analysis. The proportions of the variables of interest explained by sociodemographics, health behaviors, and work environments were calculated. Independent t-tests and Pearson's chi-squared tests were used to examine the dimensions of work ability, total WAI score, and the work ability domain for staff in different primary positions. Binary logistic regression was performed to analyze the determinants of the WAI. The WAI were categorized into two levels: 36 or less (the "poor" and "moderate" classes); and above 36 ("good" and "excellent"), which was the reference category (El Fassi et al. 2013). The three WAI domains were categorized as low or high ("weak" or "strong" and "bad" or "good") by using the median of the sum of the scores (Han et al. 2014). Independent variables were included in the multivariate analysis according to their significance in the bivariable analysis (a p-value ≤ 0.2) and their lack of collinearity. Therefore, gender, age group, education level, primary position, university type, duration of experience, WFH, NCDs, health behaviors, work-related health, and ERR were used as the controlled variables in the model. The independent variables were tested in the model using the backward selection method. The results were considered significant at the 5% significance level ($p < 0.05$).

2.7. Ethics Approval

This study obtained ethics approval from the Walailak University Ethics Committee, Thailand (WUEC-22-104-01), on 30 March 2022.

3. Results

3.1. Characteristics and Health Factors of University Staff

The participants (n = 381) were predominantly support staff (59.1%), female (63.5%), and with an average age of 43.6 (SD = 9.2). Most were comprehensive research university staff (47.2%), married (44.4%), and had obtained a master's and doctoral degree (61.4%). More than half of the participants reported NCD absence (68.5%). BMI was classified as overweight-obesity (51.2%), and performed good health behaviors (54.9%). The current work duration of the participants was ≥10 years (57.5%), and the average income per month was USD 1275. Regarding work conditions, the participants' average workdays per week were 5.4 days, the work hours per day were 8.5 h, the proportion of WFH was 52.0%, and the working environment was safe (55.9%). For the ERI analysis, the average ERR was 1.1 (SD = 0.5), and ERR > 1.0 was 54.9% (Table 1).

Table 1. Characteristics, health factors, and ERI of university staff.

Characteristics	Primary Position		
	Teaching Staff (n = 156)	Support Staff (n = 225)	Total (n = 381)
University type, n (%)			
Comprehensive research university	82 (52.6)	98 (43.6)	180 (47.2)
Technology and innovation	34 (21.8)	53 (23.6)	87 (22.8)
Area based and community	40 (25.6)	74 (32.8)	114 (29.9)
Gender, n (%)			
Male	70 (44.9)	69 (30.7)	139 (36.5)
Female	86 (55.1)	156 (69.3)	242 (63.5)
Age group (year), n (%)			
<45	64 (41.0)	134 (59.6)	198 (52.0)
≥45	92 (59.0)	91 (40.4)	183 (48.0)
Mean (SD), Min, Max	46.2 (8.0), 27, 63	41.9 (9.5), 24, 63	43.6 (9.2), 24, 63
Marital status, n (%)			
Single	68 (43.6)	84 (37.3)	152 (39.9)
Married	69 (44.2)	100 (44.5)	169 (44.4)
Widow/Separate	19 (12.2)	41 (18.2)	60 (15.7)
Educational status, n (%)			
Bachelor's degree	1 (0.6)	146 (64.9)	147 (38.6)
Master's and doctoral degree	155 (99.4)	79 (35.1)	234 (61.4)
NCDs, n (%)			
Absence	108 (69.2)	153 (68.0)	261 (68.5)
Presence	48 (30.8)	72 (32.0)	120 (31.5)

Table 1. *Cont.*

Characteristics	Primary Position		
	Teaching Staff (n = 156)	Support Staff (n = 225)	Total (n = 381)
BMI, n (%)			
≤22.9	67 (43.0)	119 (52.9)	186 (48.8)
≥23.0	89 (57.0)	106 (47.1)	195 (51.2)
Current working duration (year), n (%)			
<10	48 (30.8)	114 (50.7)	162 (42.5)
≥10	108 (69.2)	111 (49.3)	219 (57.5)
Working environment, n (%)			
Safe	91 (58.3)	122 (54.2)	213 (55.9)
Unsafe	65 (41.7)	103 (45.8)	168 (44.1)
Health behaviors			
Good	192 (59.0)	117 (52.0)	209 (54.9)
Poor	64 (41.0)	108 (48.0)	172 (45.1)
Income per month (USD), mean (SD)	1707 (929)	975 (368)	1275 (750)
Workday per week, mean (SD)	5.6 (0.7)	5.4 (0.7)	5.4 (0.7)
Workhours per day, mean (SD)	8.7 (2.0)	8.3 (1.7)	8.5 (1.8)
WFH, n (%)	94 (60.3)	104 (46.2)	198 (52.0)
Effort, mean (SD)	7.9 (2.3)	7.7 (2.1)	7.8 (2.2)
Reward, mean (SD)	17.4 (4.8)	17.4 (4.6)	17.4 (4.7)
Esteem, mean (SD)	5.5 (1.4)	5.5 (1.4)	5.5 (1.4)
Promotion, mean (SD)	7.2 (2.4)	6.9 (2.3)	7.0 (2.3)
Security, mean (SD)	4.8 (1.6)	5.0 (1.5)	4.9 (1.5)
ERR, mean (SD)	1.2 (0.6)	1.1 (0.5)	1.1 (0.5)
ERR > 1.0, %	55.1	54.7	54.9

NCD Non-Communicable Diseases, BMI Body Mass Index, WFH Work From Home, ERR Effort-Reward Ratio.

3.2. WAI and Its Domains

Table 2 shows the description and differences between WAI and its domains between teaching and support staff. According to the seven dimensions of WAI, our study found that there were differences in the average score between the two groups of staff in three dimensions, which were "Current work ability compared with the lifetime best", "Work ability in relation to the demands of the job", and "Estimated work impairment due to diseases". Likewise, the study also found a statistical difference in total WAI between the two positions of participants, of which the average WAI scores were 39.6 (SD = 4.1) and 40.4 (SD = 3.5) for teaching and support staff, respectively. In accordance with those results, the percentages of the work ability class between the two positions of the participants were also different. More than seventy percent of participants in each group had good–excellent work ability. In addition, the study found that there was a percentage difference in the perception of work ability of each group; the strong perception was 52.6 and 63.1 percent in teaching and support staff, respectively.

3.3. Crude and Final Analysis of the Associations between Work Ability and Study Variables

Table 3 shows the bivariate analysis of the rate of poor–moderate versus good-to-excellent WAI scores according to individual and occupational health factors. The crude analysis showed that factors associated with the WAI category were the primary position of university staff, WFH, NCD presence, health behavior, working environment, and ERR. The significant factors associated with the perception of the work ability sub-domain were the primary position of WFH, working environment, and ERI, whereas working experience, WFH, and NCDs were associated with the health status sub-domain and the mental resources sub-domain was associated with health behavior, working environment, and ERR.

Table 2. Dimension, score, class, and domain of WAI of university staff.

Items	Primary Position of Staff		*p*-Value
	Teaching (n = 156)	Support (n = 225)	
Dimension of work ability, mean (SD)			
(1) Current work ability compared with the lifetime best	7.8 (1.3)	8.1 (1.3)	0.007 [a]
(2) Work ability in relation to the demands of the job	7.1 (0.8)	7.3 (0.8)	0.049 [a]
(3) Numbers of current diseases diagnosed by a physician	6.1 (1.3)	6.1 (1.3)	0.995 [a]
(4) Estimated work impairment due to diseases	5.1 (0.9)	5.3 (0.8)	0.028 [a]
(5) Sick leave during the past year (12 months)	4.3 (0.6)	4.2 (0.6)	0.564 [a]
(6) Personal prognosis of work ability 2 years from now	6.2 (1.3)	6.3 (1.3)	0.441 [a]
(7) Mental resources	2.9 (0.8)	3.0 (0.8)	0.831 [a]
Total work ability index score, mean (SD)	39.6 (4.1)	40.4 (3.5)	0.039 [a]
Class of work ability, n (%)			
Good–Excellent	121 (77.6)	193 (85.8)	0.038 [b]
Poor–Moderate	35 (22.4)	32 (14.2)	
Three domains according to the purpose of WAI, n (%)			
Perception of work ability			
Weak	74 (47.4)	83 (36.9)	0.040 [b]
Strong	82 (52.6)	142 (63.1)	
Health status			
Bad	62 (39.7)	96 (42.7)	0.569 [b]
Good	94 (60.3)	129 (57.3)	
Mental resources			
Weak	45 (28.8)	63 (28.0)	0.857 [b]
Strong	111 (71.2)	162 (72.0)	

[a] Independent *t*-test, [b] chi-square test, SD Standard Deviation, WAI: Work Ability Index.

Table 3. Crude association of sociodemographic, work-related health, and effort–reward imbalance with poor or moderate work ability and its domains among university staff.

	OR (95% CI)			
	WAI	Perception of Work Ability	Health Status	Mental Resources
Gender				
Female	Ref	Ref	Ref	Ref
Male	0.9 (0.5, 1.6)	1.2 (0.8, 1.8)	0.9 (0.6, 1.4)	1.0 (0.6, 1.6)
Age group (year)				
<45	Ref	Ref	Ref	Ref
≥45	1.3 (0.8, 2.2)	1.1 (0.7, 1.6)	1.3 (0.9, 2.0)	1.0 (0.6, 1.5)
Education				
Bachelor's	Ref	Ref	Ref	Ref
Master's and Doctoral	1.6 (0.9, 2.8)	1.5 (1.0, 2.3)	1.0 (0.7, 1.6)	1.5 (0.9, 2.3)
Primary position				
Supporting staff	Ref	Ref	Ref	Ref
Teaching staff	1.7 (1.0, 3.0) *	1.5 (1.0, 2.3)*	0.9 (0.6, 1.3)	1.0 (0.7, 1.6)
Comprehensive research university				
No	Ref	Ref	Ref	Ref
Yes	1.3 (0.8, 2.2)	1.0 (0.6, 1.4)	0.8 (0.5, 1.2)	0.9 (0.6, 1.3)
Experience (year)				
<10	Ref	Ref	Ref	Ref
≥10	1.5 (0.9, 2.6)	1.2 (0.8, 1.8)	1.6 (1.0, 2.4) *	1.0 (0.6, 1.6)

Table 3. *Cont.*

	OR (95% CI)			
	WAI	**Perception of Work Ability**	**Health Status**	**Mental Resources**
Work from home				
No	Ref	Ref	Ref	Ref
Yes	2.5 (1.4, 4.5) **	1.6 (1.0, 2.4) *	1.5 (1.0, 2.3) *	1.2 (0.8, 1.9)
NCDs				
Absence	Ref	Ref	Ref	Ref
Presence	3.4 (2.0, 5.9) ***	1.3 (0.8, 1.9)	42.9 (21.4, 85.8) ***	0.9 (0.5, 1.4)
Health behaviors				
Good	Ref	Ref	Ref	Ref
Poor	2.8 (1.6, 4.8) ***	1.4 (1.0, 2.2)	0.7 (0.5, 1.1)	2.6 (1.7, 4.1) ***
Working environment				
Safe	Ref	Ref	Ref	Ref
Unsafe	2.0 (1.2, 3.4) *	1.9 (1.3, 2.9) **	1.4 (0.9, 2.1)	2.2 (1.4, 3.5) ***
ERR				
≤1.0	Ref	Ref	Ref	Ref
>1.0	3.2 (1.7, 5.6) ***	1.9 (1.2, 2.8) **	1.0 (0.7, 1.5)	3.2 (2.0, 5.2) ***

Note: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$; Ref indicates the reference group.

Table 4 demonstrates the multivariate analysis of the determinants of the WAI and its domains. The analysis showed the associations between work from home, NCDs, health behaviors, and ERR with the WAI. The probability (adj. OR [95% CI]) of having a poor-to-moderate WAI was higher in staff who conducted WFH (2.4 [1.3, 4.6]) among those with NCDs (3.5 [2.0, 6.4]), poor health behaviors (2.6 [1.4, 4.9]), and an ERR > 1.0 (2.8 [1.5, 5.6]). The probability of poorly perceived work abilities was higher in those with unsafe working environments (1.8 [1.1, 2.8]) and with an ERR > 1.0 (1.6 [1.0, 2.5]). Moreover, a higher probability of poor health status was found in those with NCDs (49.6 [23.8, 103.6]) and among those with unsafe working environments (2.1 [1.2, 3.9]); in contrast, those who had good health behaviors were associated with poor health status (0.5 [0.3, 0.9]). The probability of weak mental resources was higher among those with poor health behaviors (2.0 [1.2, 3.3]) and an ERR > 1.0 (2.7 [1.6, 4.5]).

Table 4. The binary logistic regression model of associations of sociodemographic, work-related health, and effort–reward imbalance with poor or moderate work ability and its domains among university staff.

	Adj. OR (95% CI)			
	WAI	**Perception of Work Ability**	**Health Status**	**Mental Resources**
Gender				
Female	Ref	Ref	Ref	Ref
Male	1.1 (0.6, 2.0)	1.2 (0.8, 1.9)	1.3 (0.7, 2.4)	1.0 (0.6, 1.7)
Age group (year)				
<45	Ref	Ref	Ref	Ref
≥45	0.9 (0.5, 1.9)	0.8 (0.5, 1.4)	0.8 (0.4, 1.7)	0.8 (0.4, 1.4)
Education				
Bachelor's	Ref	Ref	Ref	Ref
Master's and Doctoral	0.9 (0.4, 2.2)	1.2 (0.6, 2.1)	1.1 (0.6, 2.7)	1.9 (1.0, 3.6)
Primary position				
Support staff	Ref	Ref	Ref	Ref
Teaching staff	1.7 (0.7, 3.7)	1.3 (0.8, 2.4)	0.6 (0.3, 1.4)	0.8 (0.4, 1.4)

Table 4. *Cont.*

	Adj. OR (95% CI)			
	WAI	**Perception of Work Ability**	**Health Status**	**Mental Resources**
Comprehensive research university				
No	Ref	Ref	Ref	Ref
Yes	1.6 (0.8, 2.9)	1.0 (0.7, 1.6)	0.6 (0.3, 1.1)	1.0 (0.6, 1.7)
Experience (year)				
<10	Ref	Ref	Ref	Ref
≥10	1.7 (0.8, 3.6)	1.4 (0.8, 2.4)	1.5 (0.7, 3.2)	1.3 (0.7, 2.3)
WFH				
No	Ref	Ref	Ref	Ref
Yes	2.4 (1.3, 4.6) **	1.5 (1.0, 2.3)	1.6 (0.9, 2.9)	1.1 (0.7, 1.8)
NCDs				
Absence	Ref	Ref	Ref	Ref
Presence	3.5 (2.0, 6.4) ***	1.2 (0.8, 1.9)	49.6 (23.8, 103.6) ***	0.9 (0.5, 1.4)
Health behaviors				
Good	Ref	Ref	Ref	Ref
Poor	2.6 (1.4, 4.9) **	1.2 (0.8, 1.8)	0.5 (0.7, 0.9) *	2.0 (1.2, 3.3) **
Working environment				
Safe	Ref	Ref	Ref	Ref
Unsafe	1.6 (0.8, 2.9)	1.8 (1.1, 2.8) *	2.1 (1.2, 3.9) *	1.6 (1.0, 2.6)
ERR				
≤1.0	Ref	Ref	Ref	Ref
>1.0	2.8 (1.5, 5.6) **	1.6 (1.0, 2.5) *	0.9 (0.5, 1.6)	2.7 (1.6, 4.5) ***

Note: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$; Ref indicates the reference group.

4. Discussion

This study was conducted to explore the WAI among university staff, which represented three university types, and analyze the association between sociodemographic characteristics, health conditions, work-related health factors, ERI, and the WAI and its domains. The main results demonstrated interesting contributing factors of NCD presence, poor health behavior, WFH, and ERI associated with a poor–moderate WAI of the university staff during the COVID-19 pandemic.

The descriptive analysis demonstrated that most of the participants were female with an age < 45 years old. However, teaching staff had a higher proportion of those aged ≥ 45 years (Ilmarinen 2001). Nearly 70 percent of participants reported the absence of NCDs, but half of them were overweight or obese. The mean total WAI scores between the two groups of university staff were significantly different and aligned with the WAI classification. Most staff were in good–excellent WAI classes, of which teaching staff had a higher percentage of poor–moderate WAI than support staff. The crude analysis showed that the probability of having poor–moderate WAI was greater in teaching staff than in support staff. The other factors associated with poor–moderate WAI were WFH, NCD presence, poor health behaviors, unsafe working environment, and ERI. The sudden shift to online teaching and approximately 60 percent full-time work from home of the teaching staff may have led to increased workload and stress. These results were in line with the longitudinal results of WAI during enforced WFH among Finnish higher educational staff, which revealed that approximately half of the university staff had a good–stable level during the one-year follow-up, whereas close to one-fourth of the respondents reported a stable to moderate level of work ability (Kyrönlahti et al. 2022).

4.1. Health Conditions and Work Ability

The crude analysis demonstrated a strong association between the health status subdomain and NCD presence when the health status sub-domain was explored by current

diseases, work impairment due to diseases, and sick leave. Moreover, NCD presence and poor health behavior played important roles in increasing the risk of negative outcomes of WAI in multivariate analysis. This was consistent with former studies that denoted that poor work ability was associated with increased workers' age and NCD presence (Ilmarinen 2009; Thanapop and Thanapop 2021). However, the health status sub-domain indicated that those who had good health behaviors had a higher probability of poor health status than those with poor health behaviors. The participants who stated poor health status probably practiced good health behaviors to prevent the progress of their current NCDs and the impairments they were encountering. Moreover, most participants were free from NCDs, and almost all were overweight or obese and female, especially teaching staff. The study conducted by Idris et al. showed the association between NCDs and overweight, obesity, unhealthy diet, and lack of physical among women workers (Idris et al. 2021), which are crucial behavioral risk factors that contribute to the global burden of NCDs (World Health Organization (WHO) 2014). Moreover, obesity is a risk factor for cancer, diabetes, cardiovascular disease, and musculoskeletal disorders and can increase the likelihood of an accident or injury at work (Gu et al. 2016). Former studies showed that NCDs had been the leading cause of death among women in the past three decades, with two out of three women dying due to NCDs, particularly in LMICs (Idris et al. 2021; World Health Organization (WHO) 2016). NCD risk factors such as high blood pressure, high cholesterol, and smoking were associated with poor health behaviors in individuals. These major risk factors facilitate cardiovascular disease and other NCDs, which can lead to poor work ability by causing fatigue, shortness of breath, and difficulty concentrating (World Health Organization (WHO) 2023). Consequently, the symptoms of NCDs may affect work performance and productivity due to increased sick leave or even lead to loss of productive labor because of the high mortality of the disease. Therefore, NCDs and behavioral risk factors should be identified earlier and must not be overlooked among workers, especially female staff.

4.2. Work-Related Health, ERI, and Work Ability

Crude analysis revealed that WFH, working environment, and ERI were associated with work ability. In our study, the scope of working environments explored included work-stations, workplace facilities, and disease prevention measures, which reflected the risk of exposed occupational hazards at the workplace. The shift to remote and online teaching from home, as well as increased workloads, emotional stress, and musculoskeletal pain, have been reported as salient factors that have negatively impacted workers' work ability (Blackmore et al. 2007; Kapteyn et al. 2008; Kivimäki and Kawachi 2015). Unsafe working environments due to WFH can also negatively impact the health and engagement of workers (Burgard and Lin 2013; Jung et al. 2020; Thanapop and Thanapop 2021; Rasool et al. 2021). Although most of the participants reported safe working environments, WFH was a contributing factor to the negative work ability in multivariate analysis. This finding was also correlated with the sub-domain analysis of health status issues. Furthermore, a previous study demonstrated that the COVID-19 pandemic resulted in changes to working arrangements and health outcomes such as pain, safety, well-being, stress, depression, fatigue, quality of life, strain, and happiness (Oakman et al. 2020). Furthermore, many university staff may have struggled with isolation and lack of social and organizational support while working in remote environments; thus, these factors may have contributed to negative health outcomes and poor work ability (Rasool et al. 2021). Hence, it is important to address these issues through appropriate resource support for occupational well-being among university staff during the situation of WFH with limited workplace resources.

Our results support previous findings that work ability was associated with the ERI and working environment, and the ERI was associated with the sub-domain of perception of work ability and mental resources. These results had concordance with WFH conditions and working environmental effects on work ability of the prior discussion, which demonstrated that psychological health during WFH is a crucial factor of work ability perception among

employees, can affect productivity, and has a greater risk of work-related stress and poor mental well-being (Rasool et al. 2021). This finding also revealed the lack of mental support resources during the COVID-19 pandemic and WFH policies associated with poor health behavior, and this may induce ERI. In this study, approximately 55 percent of participants had ERRs greater than one, which reflected more effort for each reward. This indicated that ERI might be a risk factor that mediates the transition from weak work ability perception to health-related working conditions. The adverse effect of ERI and the working environment are possibly associated with poorer health behavior during the COVID-19 pandemic. According to previous studies, higher psychological job demands and lower job control also predicted new cases of poor or moderate WAI (Bethge et al. 2012). Moreover, the study of van den Berg et al. demonstrated evidence supporting these results, namely, that there is an association not only between poor work ability with lack of leisure time activity and obesity but also with high mental work demands (van den Berg et al. 2009). Mental resources should provide support for psychological well-being and coping strategies because social support can play a significant role in how individuals respond to and manage the challenges of work, especially during contexts of limited resources and conditions during the COVID-19 pandemic. Higher levels of psychological well-being and effective coping strategies are associated with healthier behaviors of employees. This is because if they receive good support, they can follow positive health behaviors in daily life. However, employees who feel under-rewarded may be vulnerable to deviant behavior because perceived lower social support reduces their motivation to perform good work (Nielsen and Einarsen 2012; Notelaers et al. 2019; Ren et al. 2019). ERI was probably associated with a lack of mental resources and support from organizations based on working conditions during the pandemic. The absence of adequate rewards manifested a deficiency in the provision of alternative measures aimed at enhancing work ability, both at the individual and organizational levels (Siegrist 2005; Bethge and Radoschewski 2012).

4.3. Limitations

Our study has some limitations. Firstly, this was a cross-sectional survey conducted during the third phase of the COVID-19 pandemic and lockdown in Thailand. The gender and age-group distributions of the sample for national representation were not ascertained owing to the constraints associated with obtaining such proportions from the university personnel databases. In addition, the WAI measure did not provide information prior to the study, including the time exposure effects of WFH. The baseline situation strongly predicted the development of work ability; therefore, the proportion of participants in the least optimal work ability profiles may be underestimated.

Secondly, the study was carried out through an online survey due to the COVID-19 pandemic and mandated WFH organizational policy. The participants may have followed self-selected choices in the study, and they may not have answered questions truthfully. They also could have misunderstood the meanings of questions and may have provided erroneous answers. Furthermore, it should be noted that the current investigation did not collect any data pertaining to potential ergonomic hazards and their consequential health effects. This also encompasses the likelihood of contracting infections or illnesses, such as COVID-19, which may significantly impact the health status and workability of the entire sample. Lastly, ERI and work ability were measured by self-reported questionnaires; a tendency to respond negatively may have been inflated via the cross-sectional association, and the findings from the ERI studies may not be generalizable to all populations and settings. Importantly, effort and reward are interdependent and may affect each other, making it difficult to distinguish their effects on the results.

4.4. Implications and Suggestions for Further Study

Our information can be used to inform occupational policies and interventions aimed at improving the work ability of university staff during and after the COVID-19 pandemic or other crises. For healthy workplace programs at universities, preventative measures,

including early detection by NCD screening programs, behavioral risk identification and assessment, health promotion, and treatment programs must be arranged by the institutions regularly. Due to crisis situations, university managers should encourage all staff to be proactive in preparing for crisis situations and provide training and resources, especially for work psychology demands and occupational hazards control in the context of constraints imposed by the management of work resources. Further study should implement the work ability improvement program at the university level, focusing mainly on the work psychology and environment using an action research study.

5. Conclusions

The primary objective of this study was to examine work ability among university staff by employing the Work Ability Index score and to investigate the relationship between various sociodemographic characteristics, health conditions, work-related health factors, effort–reward imbalance, and work ability during limited resources of working of the COVID-19 pandemic. The findings revealed that the majority of university staff members exhibited good-to-excellent levels of work ability. However, the results of the multivariate analysis model demonstrated that poor-to-moderate work ability among university staff was significantly associated with the presence of non-communicable diseases, poor health behavior, work from home, and ERI, thereby reflecting the overall quality of employees' work life. Therefore, it is crucial for organizations and university managers to provide adequate occupational support and resources to help mitigate the negative impacts of ERI and promote healthy behavior among university staff, especially during the COVID-19 pandemic and other potential disasters that may occur in the future.

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References

Bethge, Matthias, and Friedrich Michael Radoschewski. 2012. Adverse effects of effort-reward imbalance on work ability: Longitudinal findings from the German Sociomedical Panel of Employees. *International Journal of Public Health* 57: 797–805. [CrossRef]

Bethge, Matthias, Friedrich Michael Radoschewski, and Christoph Gutenbrunner. 2012. Effort-reward imbalance and work ability: Cross-sectional and longitudinal findings from the Second German Sociomedical Panel of Employees. *BMC Public Health* 12: 875. [CrossRef] [PubMed]

Bethge, Matthias, Friedrich Michael Radoschewski, and Werner Müller-Fahrnow. 2009. Work stress and work ability: Cross-sectional findings from the German sociomedical panel of employees. *Disability and Rehabilitation* 31: 1692–99. [CrossRef] [PubMed]

Blackmore, Emma Robertson, Stephen A. Stansfeld, Iris Weller, Sarah Munce, Brandon M. Zagorski, and Donna E. Stewart. 2007. Major depressive episodes and work stress: Results from a national population survey. *American Journal of Public Health* 97: 2088–93. [CrossRef] [PubMed]

Buapetch, Aporntip, Sunee Lagampan, Julia Faucett, and Surintorn Kalampakorn. 2008. The Thai version of Effort-Reward Imbalance Questionnaire (Thai ERIQ): A study of psychometric properties in garment workers. *Journal of Occupational Health* 50: 480–91. [CrossRef]

Burgard, Sarah A., and Katherine Y. Lin. 2013. Bad Jobs, Bad Health? How Work and Working Conditions Contribute to Health Disparities. *The American Behavioral Scientist* 57: 1105–27. [CrossRef] [PubMed]

Cavanagh, Stephen J. 1992. Job satisfaction of nursing staff working in hospitals. *Journal of Advanced Nursing* 17: 704–11. [CrossRef]

Cochran, William G. 1977. *Sampling Techniques*, 3rd ed. New York: JohnWiley & Sons.

El Fassi, Mehdi, Valery Bocquet, Nicole Majery, Marie Lise Lair, Sophie Couffignal, and Philippe Mairiaux. 2013. Work ability assessment in a worker population: Comparison and determinants of Work Ability Index and Work Ability score. *BMC Public Health* 13: 305. [CrossRef]

Ertürk, Ramazan. 2022. The effect of teachers' quality of work life on job satisfaction and turnover intentions. *International Journal of Contemporary Educational Research* 9: 191–203. [CrossRef]

Ge, Jingjing, Jing He, Yan Liu, Juying Zhang, Jingping Pan, Xueli Zhang, and Danping Liu. 2021. Effects of effort-reward imbalance, job satisfaction, and work engagement on self-rated health among healthcare workers. *BMC Public Health* 21: 195. [CrossRef]

Griep, Rosane Härter, Aline Araújo Nobre, Márcia Guimarães de Mello Alves, Maria de Jesus Mendes da Fonseca, Letícia de Oliveira Cardoso, Luana Giatti, Enirtes Caetano Prates Melo, Susanna Toivanen, and Dóra Chor. 2015. Job strain and unhealthy lifestyle: Results from the baseline cohort study, Brazilian Longitudinal Study of Adult Health (ELSA-Brasil). *BMC Public Health* 15: 309. [CrossRef]

Gu, Ja K., Luenda E. Charles, Michael E. Andrew, Claudia C. Ma, Tara A. Hartley, John M. Violanti, and Cecil M. Burchfiel. 2016. Prevalence of work-site injuries and relationship between obesity and injury among U.S. workers: NHIS 2004–2012. *Journal of Safety Research* 58: 21–30. [CrossRef]

Han, Lu, Leiyu Shi, Liming Lu, and Li Ling. 2014. Work ability of Chinese migrant workers: The influence of migration characteristics. *BMC Public Health* 14: 353. [CrossRef] [PubMed]

Heath, Andrew. 2016. Workplace Happiness and Wellbeing—It Is a State of Mind. Available online: http://www.huffingtonpost.co.uk/andrew-heath/workplace-happiness-and-w_b_12027592.html (accessed on 25 January 2023).

Idris, Idayu Badilla, Noor Atika Azit, Siti Rasidah Abdul Ghani, Sharifah Fazlinda Syed Nor, and Azmawati Mohammed Nawi. 2021. A systematic review on noncommunicable diseases among working women. *Industrial Health* 59: 146–60. [CrossRef] [PubMed]

Ilmarinen, Juhani E. 2001. Aging workers. *Occupational and Environmental Medicine* 58: 546–52. [CrossRef]

Ilmarinen, Juhani, Kaija Tuomi, Leena Eskelinen, Clas-Håkan Nygård, Pekka Huuhtanen, and Matti Klockars. 1991. Background and objectives of the Finnish research project on aging workers in municipal occupations. *Scandinavian Journal of Work, Environment & Health* 17: 7–11.

Ilmarinen, Juhani. 2007. The Work Ability Index (WAI). *Occupational Medicine* 57: 160. [CrossRef]

Ilmarinen, Juhani. 2009. Work ability—A comprehensive concept for occupational health research and prevention. *Scandinavian Journal of Work, Environment & Health* 35: 1–5. [CrossRef]

Jung, Minhyuk, Soram Lim, and Seokho Chi. 2020. Impact of Work Environment and Occupational Stress on Safety Behavior of Individual Construction Workers. *International Journal of Environmental Research and Public Health* 17: 8304. [CrossRef] [PubMed]

Kaewboonchoo, Orawan, and Paul Ratanasiripong. 2015. Psychometric properties of the Thai version of the work ability index (Thai WAI). *Journal of Occupational Health* 57: 371–77. [CrossRef]

Kapteyn, Arie, James P. Smith, and Arthur Van Soest. 2008. Dynamics of work disability and pain. *Journal of Health Economics* 27: 496–509. [CrossRef]

Kivimäki, Mika, and Ichiro Kawachi. 2015. Work Stress as a Risk Factor for Cardiovascular Disease. *Current Cardiology Reports* 17: 630. [CrossRef] [PubMed]

Kivimäki, Mika, Marianna Virtanen, Marko Elovainio, Anne Kouvonen, Ari Väänänen, and Jussi Vahtera. 2006. Work stress in the etiology of coronary heart disease—A meta-analysis. *Scandinavian Journal of Work, Environment & Health* 32: 431–42. [CrossRef]

Kyrönlahti, Saila, Subas Neupane, Clas-Håkan Nygård, Jodi Oakman, Soile Juutinen, and Anne Mäkikangas. 2022. Perceived Work Ability during Enforced Working from Home Due to the COVID-19 Pandemic among Finnish Higher Educational Staff. *International Journal of Environmental Research and Public Health* 19: 6230. [CrossRef] [PubMed]

Martinez, Maria Carmen, Maria do Rosário Dias de Oliveira Latorre, and Frida Marina Fischer. 2009. Validity and reliability of the Brazilian version of the Work Ability Index questionnaire. *Revista de Saude Publica* 43: 525–32. [CrossRef]

Matthews, Russell A., Julie H. Wayne, Claire Smith, Wendy J. Casper, Yi-Ren Wang, and Jessica Streit. 2022. Resign or carry-on? District and principal leadership as drivers of change in teacher turnover intentions during the COVID-19 crisis: A latent growth model examination. *Journal of Occupational and Organizational Psychology* 95: 687–717. [CrossRef]

Minihan, Elisha, Dimitrios Adamis, Michele Dunleavy, Angela Martin, Blanaid Gavin, and Fiona McNicholas. 2022. COVID-19 related occupational stress in teachers in Ireland. *International Journal of Educational Research Open* 3: 100114. [CrossRef]

Nielsen, Morten Birkeland, and Ståle Einarsen. 2012. Outcomes of exposure to workplace bullying: A meta-analytic review. *Work Stress* 26: 1–24. [CrossRef]

Nieuwenhuijsen, Karen, David Bruinvels, and Monique Frings-Dresen. 2010. Psychosocial work environment and stress-related disorders, a systematic review. *Occupational Medicine (Oxford, England)* 60: 277–86. [CrossRef]

Notelaers, Guy, Maria Törnroos, and Denise Salin. 2019. Effort-Reward Imbalance: A Risk Factor for Exposure to Workplace Bullying. *Frontiers in Psychology* 10: 386. [CrossRef]
Oakman, Jodi, Natasha Kinsman, Rwth Stuckey, Melissa Graham, and Victoria Weale. 2020. A rapid review of mental and physical health effects of working at home: How do we optimise health? *BMC Public Health* 20: 1825. [CrossRef]
Rasool, Samma Faiz, Mansi Wang, Minze Tang, Amir Saeed, and Javed Iqbal. 2021. How Toxic Workplace Environment Effects the Employee Engagement: The Mediating Role of Organizational Support and Employee Wellbeing. *International Journal of Environmental Research and Public Health* 18: 2294. [CrossRef] [PubMed]
Ren, Chuang, Xiying Li, Xuemei Yao, Zhongling Pi, and Senqing Qi. 2019. Psychometric Properties of the Effort-Reward Imbalance Questionnaire for Teachers (Teacher ERIQ). *Frontiers in Psychology* 10: 2047. [CrossRef] [PubMed]
Rumakhom, Vassiga, and Theechaghan Phatcharrachiraphan. 2022. Educational Administration in new normal after COVID-19 crisis. *Journal of MCU Nakhondhat* 9: 16–30. Available online: https://so03.tci-thaijo.org/index.php/JMND/article/download/262032/174362/982510 (accessed on 15 January 2023). (In Thai).
Sanderson, Kristy, and Gavin Andrews. 2006. Common mental disorders in the workforce: Recent findings from descriptive and social epidemiology. *Canadian Journal of Psychiatry. Revue Canadienne de Psychiatrie* 51: 63–75. [CrossRef] [PubMed]
Schmidt, Burkhard, Raphael M. Herr, Marc N. Jarczok, Jens Baumert, Karoline Lukaschek, Rebecca T. Emeny, Karl-Heinz Ladwig, and KORA Investigators. 2018. Lack of supportive leadership behavior predicts suboptimal self-rated health independent of job strain after 10 years of follow-up: Findings from the population-based MONICA/KORA study. *International Archives of Occupational and Environmental Health* 91: 623–31. [CrossRef] [PubMed]
Selander, Kirsikka, Risto Nikunlaakso, and Jaana Laitinen. 2022. Association between work ability and work stressors: Cross-sectional survey of elderly services and health and social care service employees. *Archives of Public Health = Archives belges de sante publique* 80: 83. [CrossRef]
Siegrist, J. 1996. Adverse health effects of high-effort/low-reward conditions. *Journal of Occupational Health Psychology* 1: 27–41. [CrossRef]
Siegrist, Johannes, Dagmar Starke, Tarani Chandola, Isabelle Godin, Michael Marmot, Isabelle Niedhammer, and Richard Peter. 2004. The measurement of effort-reward imbalance at work: European comparisons. *Social Science & Medicine* 58: 1483–99. [CrossRef]
Siegrist, Johannes, Jian Li, and Diego Montano. 2014. *Psychometric Properties of the Effort-Reward Imbalance Questionnaire*. Germany: Duesseldorf University, pp. 1–13.
Siegrist, Johannes. 2005. Social reciprocity and health: New scientific evidence and policy implications. *Psychoneuroendocrinology* 30: 1033–38. [CrossRef]
Stansfeld, Stephen, and Bridget Candy. 2006. Psychosocial work environment and mental health—A meta-analytic review. *Scandinavian Journal of Work, Environment & Health* 32: 443–62. [CrossRef]
Suresh, Karthik, Sanjeev V. Thomas, and Geetha Suresh. 2011. Design, data analysis and sampling techniques for clinical research. *Annals of Indian Academy of Neurology* 14: 287–90. [CrossRef]
Thanapop, Sasithorn, and Chamnong Thanapop. 2021. Work ability of Thai older Workers in Southern Thailand: A comparison of formal and informal sectors. *BMC Public Health* 21: 1218. [CrossRef] [PubMed]
Tuomi, Kaija, Pekka Huuhtanen, Erkki Nykyri, and Juhani Ilmarinen. 2001. Promotion of work ability, the quality of work and retirement. *Occupational Medicine* 51: 318–24. [CrossRef] [PubMed]
van den Berg, Tilja, Leo Elders, Bart de Zwart, and Alex Burdorf. 2009. The effects of work-related and individual factors on the Work Ability Index: A systematic review. *Occupational and Environmental Medicine* 66: 211–20. [CrossRef] [PubMed]
WHO Expert Consultation. 2004. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *Lancet* 363: 157–63. [CrossRef]
World Health Organization (WHO). 2011. *World Report on Disability*. Geneva: WHO.
World Health Organization (WHO). 2014. *Non-Communicable Diseases. Country Profiles*. Geneva: WHO. Available online: https://apps.who.int/iris/bitstream/handle/10665/128038/9789241507509_eng.pdf;jsessionid=BF820337537E2F816BABF64F83789423?sequence=1 (accessed on 13 January 2023).
World Health Organization (WHO). 2016. WHO | NCD and Women. Available online: https://www.who.int/global-coordination-echanism/ncd-themes/NCD-andwomen/en/ (accessed on 3 January 2022).
World Health Organization (WHO). 2023. Cardiovascular Disease Risk Factors. Available online: https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds) (accessed on 25 January 2023).