Work ability index among healthcare personnel in a university hospital in Tehran, Iran

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Abstract

BACKGROUND: Work ability is an important issue from a social point of view, as it is essential for workers health and welfare.

OBJECTIVE: This study aimed to determine work ability among healthcare personnel and to investigate its relationship with demographic and lifestyle-related factors.

METHODS: Data were collected using the Work Ability Index (WAI) questionnaire among 517 personnel of a hospital in Tehran, Iran.

RESULTS: Findings showed a mean WAI of 40.3 (±5.2) for the study population. Work ability was significantly lower in the older personnel and higher for men. A significant correlation was observed between BMI and exercise activity and WAI score. Moreover, employees with experience of less than five years had significant higher work ability than those with 16–20 years of service.

CONCLUSIONS: Considering the young study population, it seems the mean WAI is not as desirable. The use of lifestyle promoting programs, besides workplace interventions, can be an effective strategy to increase work ability among healthcare workers.

Keywords: WAI, work demand, lifestyle, Ergonomics

1. Introduction

The concept of work ability is constructed on the balance between individual resources and work demands [1]. Work ability is the basis of welfare and health in everyone’s life [2]. Hence, research on work ability is an important issue from a social approaches perspective [2]. Many factors influence work ability such as work type and conditions, work organization, psychosocial factors, and personal characteristics [3–5]. Therefore, in order to enhance individuals’ work ability, some intervention strategies should be adopted to control the related influencing factors [6]. This versatile relation of work ability with various factors, has intensified and challenged its definition [7].

It is difficult to provide a definition of work ability with the diversity of job tasks within healthcare personnel. The concept of work ability does not belong to
a specific branch of science which could be defined clearly [2]. However, Ilmarinen and Tuomi defined work ability as “an index that shows how much workers are able to do their duty at best according to work requirements, health status, and mental and intellectual capabilities” [8]. Maintaining work ability, avoiding early retirement of employees and increasing employees’ efficiency to improve quality and reduce costs has always been challenges for employers and managers. In recent years, the issue of work ability and its improvement has been taken into consideration, because if work requirements are not balanced with employees’ physical and psychological abilities, it can lead to safety and health problems, costs increase and early retirement of employees [9].

The healthcare work force is exposed to high levels of physical and psychological stressors, with consequent sickness absence [10]. This occupational group works under difficult conditions including shift work, high level of physical demand, and mental stress which necessitates the adoption of strategies for the promotion of healthy working conditions and maintenance of work ability [11].

Various methods have been employed to assess operators’ work ability. For instance, work ability has been estimated by the long-term sickness absences during the past year. In this regard, researchers in the Finnish Institute of Occupational Health (FIOH) presented a questionnaire called the Work Ability Index (WAI) which combined various dimensions of work ability together. Studies conducted by (FIOH) on work ability showed that this tool anticipates changes in work ability in different job groups; however, it should be noted that the score of the Work Ability Index reflects the amount and quality of interaction between work and worker and should not be interpreted as a health index for workers (2-1).

Using this index, it can be determined which employees or job groups need more support. Studies have showed that by choosing correct and on-time interventions, work ability reduction procedure could be decelerated [12].

Considering the practical importance of the WAI and evaluating reciprocal effects of work conditions and environment on employees’ health status, specifically in high-stress environments like hospitals, this study aimed to evaluate the WAI among personnel of a university hospital in Iran and to compare it between various job groups in order to identify the impact of environment and work conditions on the employees’ health status.

2. Materials and methods

2.1. Study design and subjects

The present research was a cross-sectional and descriptive-analytical study conducted among 517 healthcare personnel in Baharloo University Hospital, Tehran, Iran. The study population consisted of different job categories that were classified into four groups: group 1 (253 individuals including nurses, obstetricians, operating room technicians, and anesthetist technicians), group 2 (47 physicians), group 3 (102 administrative staff), and group 4 (115 nurse-aides and service staff).

In this study, the Work Ability Index Questionnaire (WAI) was used in order to assess the work ability. The Persian version of this questionnaire has been prepared in the previous studies, which is proved to be a reliable and valid tool for assessing work ability [13, 14]. All information related to the questionnaire was completely explained to the participants before distribution and completion of the questionnaires. In addition, all participants filled out consent form approved by the Research Ethics Committee of Tehran University of Medical Sciences (TUMS).

2.2. WAI questionnaire

The WAI questionnaire consisted of 10 questions and a list of diseases which assess seven dimensions: 1) Current work ability compared with the lifetime best, 2) Work ability in relation to the demands of the job, 3) Number of current diseases diagnosed by a physician, 4) Estimated work impairment due to diseases, 5) Sick leave during the past 12 months, 6) Personal prognosis of work ability 2 years from now, and 7) Mental resources. Final score would be a value ranged 7–49, which is divided into four distinctive categories as poor (7–27), moderate (28–36), good (37–43) and excellent (44–49) scores. Work ability level would be finally determined based on the final score of the work ability index.

2.3. Statistical analysis

Collected data were analyzed statistically using SPSS software version 11.5. One-way ANOVA and Independent T-Test were used to compare work ability index among participants with different personal characteristics and lifestyle-related factors. The effect of each dimensions of the work ability index on WAI score was determined using the Spearman correlation
coefficient. Furthermore, linear regression analysis was applied to find the most influencing variables on WAI. The $P$-value less than 0.05 considered to be statistically significant.

### 3. Results

The study population comprised of 156 men (30.2%) and 361 women (69.8%). The mean age of the participants was 33.4 (±8.2) years (minimum = 21 years and maximum = 64 years) and on average they had 6.6 ± 6.8 years of work experience (Table 1). The mean (±SD) score of Work Ability Index obtained was 40.3 (±5.2) among the study population. Regarding WAI score, it was in the “Poor” category for 1.4% of participants, in the “Moderate” category for 21.1%, in the “Good” and “Excellent” categories for 46% and 31.5% of individuals, respectively.

According to ANOVA analysis, a significant difference was observed between mean WAI score among the four job groups ($P$-value < 0.001). Group 2 (physicians) had a higher mean work ability index (41.9 ± 4.4) compared to other occupational groups (Table 2). Moreover, Post hoc Tukey test showed a significant difference between group 1 and groups 2, 3, and 4 ($P$-value < 0.05) (Table 2).

It was revealed that male participants had higher mean WAI (42.37 ± 4.40). Participants with Ph.D or M.D educational level had the highest work ability index (41.80 ± 4.41) among studied educational groups (Table 3). Moreover, this educational group showed the highest percentage of “Excellent” category for WAI (46.8%). According to Post hoc Tukey test, a significant difference was shown between participants with associate and bachelor degrees and participants with Ph.D and M.D educational level ($P$-value < 0.04).

Regarding work experience, individuals with experience of less than five years showed the highest WAI (40.97) (Table 3). Moreover, according to Post hoc analyses, workers with less than five years of service had significant higher WAI than those with 16–20 years of experience ($P$-value = 0.003). What is more, mean WAI was higher among employees with physical work nature (mean WAI = 41.69).

Individuals who engaged actively in sport activities showed a higher mean of WAI score. Individuals with body mass index of 18 to 24.9, had a higher WAI score (40.73 ± 5.06) than those with a body mass index of more than 25 (39.62 ± 5.48, $P$-value = 0.021). However, WAI score did not statistically differ within various groups related to age, marital status, working schedule, second job, smoking, and previous job (Table 3).

The associations between demographic and lifestyle-related variables and WAI score were investigated in this study, as well (Table 4). The results of multiple linear regression analysis manifested that the mean WAI score had a significant association with age, gender, BMI, education, and work type. In this regard, an inverse association was found between WAI and age ($B = -0.110$, $P = 0.000$) and BMI ($B = -0.208$, $P = 0.001$). It was observed that by every one year increase in age, work ability index decreased by 0.11 and it reduced by 0.208 for every unit increase in BMI. With higher levels of education, work ability index was higher in group 1 (with Ph.D or M.D) more than group 2 (with associate and bachelor degree) and in group 2 more than group 3 (not educated or diploma) (by 1.188). Moreover, WAI score was higher among nurses (by 2.45); and finally, considering gender variable, women showed lower work ability compared to the men (Table 4).

Evaluating the correlation between each items of the WAI and the final score of Work Ability Index

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>7</td>
<td>1.4</td>
</tr>
<tr>
<td>Moderate</td>
<td>109</td>
<td>21.1</td>
</tr>
<tr>
<td>Good</td>
<td>238</td>
<td>46</td>
</tr>
<tr>
<td>Excellent</td>
<td>163</td>
<td>31.5</td>
</tr>
<tr>
<td>Total</td>
<td>517</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Occupational groups</th>
<th>Frequency</th>
<th>Percentage</th>
<th>Mean</th>
<th>SD</th>
<th>$P$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1 (nurses, obstetricians, operating and anesthetist technicians) room technicians,</td>
<td>253</td>
<td>57.9</td>
<td>39.1</td>
<td>5</td>
<td>0.001</td>
</tr>
<tr>
<td>Group 2 (physicians)</td>
<td>47</td>
<td>9.1</td>
<td>41.9</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>Group 3 (administrative staff)</td>
<td>102</td>
<td>19.7</td>
<td>40.8</td>
<td>5.6</td>
<td></td>
</tr>
<tr>
<td>Group 4 (nurse-aides and service staff)</td>
<td>115</td>
<td>22.2</td>
<td>41.7</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>
Table 3
WAI mean and standard deviation, P-values of statistics analyses for demographic and life-style related variables

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Frequency (percentage)</th>
<th>Mean</th>
<th>SD</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20–30</td>
<td>249 (48.2)</td>
<td>40.60</td>
<td>4.97</td>
<td>0.355</td>
</tr>
<tr>
<td>31–40</td>
<td>166 (32.1)</td>
<td>40.25</td>
<td>5.56</td>
<td></td>
</tr>
<tr>
<td>41–50</td>
<td>78 (15.1)</td>
<td>40.01</td>
<td>5.52</td>
<td></td>
</tr>
<tr>
<td>&gt;50</td>
<td>24 (4.6)</td>
<td>38.73</td>
<td>4.20</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>156 (69.8)</td>
<td>42.37</td>
<td>4.40</td>
<td>0.000</td>
</tr>
<tr>
<td>Female</td>
<td>361 (30.2)</td>
<td>39.43</td>
<td>5.31</td>
<td></td>
</tr>
<tr>
<td>Marriage status</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>142 (27.5)</td>
<td>40.84</td>
<td>4.55</td>
<td>0.129</td>
</tr>
<tr>
<td>Married</td>
<td>375 (72.5)</td>
<td>40.12</td>
<td>5.45</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school graduate, diploma</td>
<td>139 (26.89)</td>
<td>40.61</td>
<td>5.51</td>
<td>0.030</td>
</tr>
<tr>
<td>Associate and bachelor degrees</td>
<td>331 (64.02)</td>
<td>39.92</td>
<td>5.14</td>
<td></td>
</tr>
<tr>
<td>Ph.D., M.D.</td>
<td>47 (9.09)</td>
<td>41.80</td>
<td>4.41</td>
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</tr>
<tr>
<td>Work experience</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤5</td>
<td>300 (58.6)</td>
<td>40.97</td>
<td>4.65</td>
<td>0.001</td>
</tr>
<tr>
<td>6–10</td>
<td>107 (20.9)</td>
<td>40.05</td>
<td>5.57</td>
<td></td>
</tr>
<tr>
<td>11–15</td>
<td>48 (9.4)</td>
<td>38.82</td>
<td>6.48</td>
<td></td>
</tr>
<tr>
<td>16–20</td>
<td>31 (6.1)</td>
<td>37.45</td>
<td>6.46</td>
<td></td>
</tr>
<tr>
<td>&gt;20</td>
<td>26 (5.1)</td>
<td>39.6</td>
<td>4.50</td>
<td></td>
</tr>
<tr>
<td>Working schedule</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shift worker</td>
<td>372 (72)</td>
<td>40.37</td>
<td>4.83</td>
<td>0.724</td>
</tr>
<tr>
<td>Day worker</td>
<td>145 (28)</td>
<td>40.17</td>
<td>6.14</td>
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<tr>
<td>Second job</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Yes</td>
<td>63 (12.2)</td>
<td>41.44</td>
<td>5.17</td>
<td>0.069</td>
</tr>
<tr>
<td>No</td>
<td>454 (87.8)</td>
<td>40.16</td>
<td>5.22</td>
<td></td>
</tr>
<tr>
<td>Work type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td>102 (19.7)</td>
<td>41.69</td>
<td>5.01</td>
<td>0.001</td>
</tr>
<tr>
<td>Mental</td>
<td>115 (22.2)</td>
<td>40.84</td>
<td>5.64</td>
<td></td>
</tr>
<tr>
<td>Physical and mental</td>
<td>300 (58)</td>
<td>39.61</td>
<td>5.05</td>
<td></td>
</tr>
<tr>
<td>Exercise activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>150 (29)</td>
<td>41.50</td>
<td>4.83</td>
<td>0.001</td>
</tr>
<tr>
<td>No</td>
<td>367 (71)</td>
<td>39.83</td>
<td>5.31</td>
<td></td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>13 (2.5)</td>
<td>38.08</td>
<td>6.48</td>
<td>0.118</td>
</tr>
<tr>
<td>No</td>
<td>504 (97.5)</td>
<td>40.37</td>
<td>5.18</td>
<td></td>
</tr>
<tr>
<td>Previous job</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>144 (27.85)</td>
<td>40.52</td>
<td>5.10</td>
<td>0.570</td>
</tr>
<tr>
<td>No</td>
<td>373 (72.15)</td>
<td>40.23</td>
<td>5.28</td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18–24.9</td>
<td>317 (62)</td>
<td>40.73</td>
<td>5.06</td>
<td>0.021</td>
</tr>
<tr>
<td>≥25</td>
<td>194 (38)</td>
<td>39.62</td>
<td>5.48</td>
<td></td>
</tr>
</tbody>
</table>

showed the highest level of solidarity between item “anticipated individual’s work ability within the next two years” and the final score of the WAI (Spearman correlation coefficient = 0.723) (Table 5).

4. Discussion

The aim of the current study was to evaluate work ability index among personnel of a university hospital and to assess the influences of demographic characteristics and lifestyle-related factors on their work ability. Ilmarinen et al. [15] recommended monitoring of work ability in order to predict the likelihood of disability and early retirement and to assist in the early identification of underlying causes [15, 16].

According to the results of the present survey, the mean score of the WAI was estimated 40.3, which is in the “Good” category (37–43). Similar results have been found in the preceding studies; as in the study by Costa et al. [11] and also Nachiappan et al. [19] in which a mean work ability index of 39.7 and 42.6 was reported, respectively. Although the WAI score is somehow similar to what we found, considering
the higher mean age in those studies, small difference might be attributed to either individual factors or work conditions. It is worth noting that social and cultural factors both may influence the individual factors and working conditions, as well [17].

In this survey, the maximum WAI was found in physicians (41.9) and the lowest WAI score (39.1) was found in the group including nurses, obstetricians, operating room, and anesthetist technicians. Lower work ability among nurses and obstetricians, operating room, and anesthetist technicians might be due to the higher physical–mental demands of these jobs, as well as the risk factors which often exist in their working environments. In the study by Ilmari nen et al. [18], it was shown that in work settings with physical and physical–mental nature, work ability index had a descending status [18]. Moreover, this finding is consistent with the results of the study carried out by Abdolalizadeh et al. [13] in which a low work ability index was reported in nursing and health care group [13]. However, Nachiappan et al. [19] found a better work ability for nurses and managers in comparison with doctors and domestic assistants [19].

Lifestyle-related factors examined in this study included obesity, smoking and physical activity. The findings showed individuals with higher BMI and without physical activities had lower work ability. Other studies have shown the deteriorating effects of lack of physical activity and being overweight on work ability [20–22]. Furthermore, personal characteristics were assessed as one of the effective factors on work ability, including age, education and work experience [5, 23, 24]. In this study, individuals with higher educational status had higher work ability index. Several previous studies have proven the relationship between a high work ability index and higher level of education [23, 25]. It is assumed that those employees with higher level of education have better employment and socio-economic status, and also better work health. Education increases individuals control over their work. Moreover, the professional skills provided by education have a substantial impact on the ability to work [2, 18]. However, in a study by Reily et al. (2009) no significant relationship was observed between education and work ability [16].

Regarding job tenure, those with more work experience had a lower work ability index. This may be related to the effect of aging along with work experience [26]. One may argue that job tenure may affect individuals work ability through better adaptation to the work environment and perception. But, it seems that aging factor has predominantly stronger effect on work ability impairment [27].

In this study, no significant difference was found between the work ability index of shift and non-shift workers. In a study by Golubic et al. [23] among nurses with 38.7 years of age and 13.9 years of work, a significant association was found between being and not being a shift worker [23]. This lack of difference is probably caused by lower mean age and work experience of our study population in comparison with similar studies.

Mean work ability index for men was higher than women, which is in accordance with the result of a study done in Italy [20]. However, in a research among healthcare workers in the UK, WAI was reported to be higher in women [19].

In the present study, mean work ability index was not significantly different between single and married groups. On the contrary, in a study by Golubic et al. [23], nurses who lived alone had a higher work ability index than those lived with a partner [23].

Altogether, results of this research imply the effect of gender, job tenure, work type, smoking, and BMI on work ability among health care workers. Having reviewed 20 studies, van den Berg et al. (2009) identified important factors for a decreased work ability as lack of physical activity, poor musculoskeletal

### Table 4
Results of multiple linear regression analysis for WAI scores by demographic and background variables

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>Beta</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-0.110</td>
<td>-0.173</td>
<td>0.000</td>
</tr>
<tr>
<td>Sex</td>
<td>-2.895</td>
<td>-0.254</td>
<td>0.000</td>
</tr>
<tr>
<td>BMI</td>
<td>-0.208</td>
<td>-0.139</td>
<td>0.001</td>
</tr>
<tr>
<td>Educational group</td>
<td>1.188</td>
<td>0.130</td>
<td>0.003</td>
</tr>
<tr>
<td>Occupational group</td>
<td>2.450</td>
<td>0.234</td>
<td>0.000</td>
</tr>
</tbody>
</table>

### Table 5
Spearman correlations between WAI dimensions and total WAI

<table>
<thead>
<tr>
<th>Item</th>
<th>r</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current work ability compared with the lifetime best</td>
<td>0.544</td>
<td>0.000</td>
</tr>
<tr>
<td>Work ability in relation to the demands of the job</td>
<td>0.614</td>
<td>0.000</td>
</tr>
<tr>
<td>Number of current diseases diagnosed by a physician</td>
<td>0.649</td>
<td>0.000</td>
</tr>
<tr>
<td>Estimated work impairment due to diseases</td>
<td>0.620</td>
<td>0.000</td>
</tr>
<tr>
<td>Sick leave during the past 12 months</td>
<td>0.250</td>
<td>0.000</td>
</tr>
<tr>
<td>Personal prognosis of work ability 2 years from now</td>
<td>0.723</td>
<td>0.000</td>
</tr>
<tr>
<td>Mental resources</td>
<td>0.481</td>
<td>0.000</td>
</tr>
</tbody>
</table>
capacity, older age, obesity, and high physical and psychosocial work demand [4].

Regarding correlation between total WAI score and its items, the highest correlation belonged to item “personal prognosis of work ability 2 years from now”. Abdolalizadeh et al. [13] reported the highest correlation for “work ability in relation to physical demands” for health care workers. Moreover, in this study the lowest correlation was for item “sick leave during the past 12 months” which is in accordance with those of Abdolalizadeh et al. This low correlation can be attributed to low mean age of the study participants and lack of care about their health status. In addition, low level of sick leave may show lack of health surveillance system.

5. Conclusion

Although the mean work ability index is in the “Good” category in the present study, based on the FIOH guideline, considering the age of the study population it is lower than expected or the desired level. Therefore, it is suggested that preventive programs, related to lifestyle improvement, be taken into consideration in order to increase work ability. Training programs can include exercise at work, smoking cessation programs, nutrition and weight management programs, etc. Moreover, it is recommended to regularly use WAI questionnaire as a quantitative indicator along with periodic examinations of employees.

Acknowledgments

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Conflict of interest

The authors declare that there are no conflicts of interest.

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