Work Ability Index (WAI) and Its Health-related Determinants among Iranian Farmers Working in Small Farm Enterprises

Akbar Rostamabadi¹, Adel Mazloumi² and Abbas Rahimi Foroushani³

¹Department of Occupational Health Engineering, Ashtian Health Care Center, Arak University of Medical Sciences, Iran, ²Department of Occupational Health Engineering, School of Public Health, Tehran University of Medical Sciences, Iran and ³Department of Biostatistics and Epidemiology, School of Public Health, Tehran University of Medical Sciences, Iran

Abstract: Work Ability Index (WAI) and Its Health-related Determinants among Iranian Farmers Working in Small Farm Enterprises: Akbar Rostamabadi, et al. Department of Occupational Health Engineering, Ashtian Health Care Center, Arak University of Medical Sciences, Iran—Objectives: This study aimed to determine the Work Ability Index (WAI) and examine the influence of health dimensions and demographic variables on the work ability of Iranian farmers working in small farm enterprises. Method: A cross-sectional study was conducted among 294 male farmers. The WAI and SF-36 questionnaires were used to determine work ability and health status. The effect of demographics variables on the work ability index was investigated with the independent samples t-test and one-way ANOVA. Also, multiple linear regression analysis was used to test the association between the mean WAI score and the SF-36 scales. Results: The mean WAI score was 35.1 (SD=10.6). One-way ANOVA revealed a significant relationship between the mean WAI and age. Multiple linear regression analysis showed that work ability was more influenced by physical scales of the health dimensions, such as physical function, role-physical, and general health, whereas a lower association was found for mental scales such as mental health. Conclusions: The average WAI was at a moderate work ability level for the sample population of farmers in this study. Based on the WAI guidelines, improvement of work ability and identification of factors affecting it should be considered a priority in interventional programs. Given the influence of health dimensions on WAI, any intervention program for preservation and promotion of work ability among the studied farmers should be based on balancing and optimizing the physical and psychosocial work environments, with a special focus on reducing physical work load.

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Since the first half of the twentieth century, population ageing has been taking place throughout the entire world and in countries at various levels of development. This ageing phenomenon is progressing rapidly in developing countries, including in countries with large populations of young people such as Iran¹. Census and survey results during the last few decades show that Iran will be faced with an ageing population in the near future. Based on experiences from demographic transitions and projections for the period 2000–2050, Iran will witness the following demographic changes over the next four decades²: an increase in the relative share of the 65 years and older population to about 20 percent in 2050, relative stability of the under 15 years old population at about 17 percent in the same period and a gradual decrease in the share of the working-age population (people aged 15–64 years). This situation will lead to labor shortages and the need to increase work participation, particularly at middle and older ages.

The ageing process reflects both work and life conditions. From the occupational health point of view, the term ageing is generally applied to the period when major changes occur in relevant work-related functions during the course of the work life of a worker³. In developed countries, the age of 45 or 50 years has often been used as the base criterion for the term "ageing worker"⁴. Further, in these countries, the rate of participation in the labor force has been reported to be lower (around 50%) at the ages of 55 to 59 or older, and there has been an early exit
of this age group from work life. In developing countries such as Iran, these conditions may be more critical because of poorer life and work conditions as compared with developed countries.

In order to increase work participation of older workers and decrease possibilities for premature departure from working life, the concept of work ability was developed in the early 1980s in Finland. Considering different dimensions of work ability including the health conditions of employees, an individual’s capability and work-related factors, the Finnish scientists presented a comprehensive conceptual model, the “work ability house”, in which work ability is expressed as the balance between human resources and work demands. To operationalize this model after wide clinical assessments, these scientists constructed a questionnaire-based method, the Work Ability Index (WAI), which has proved to be a reliable index for the prediction of early retirement, disability, morbidity, and mortality in studies concerning ageing workers.

Today, the WAI has been adapted as a common practical tool for measurement of the work ability of individuals in many countries around the world. In Iran, data on the work ability of workforce are very rare. Recently, the Persian version of the WAI has been translated and adopted, and investigations on factors associated with work ability among the Iranian working population are underway.

There is a large body of evidence showing that people working in farming jobs are exposed to a wide range of physical, mental and social overstrains affecting their health and work ability. Considering its physical nature, farming is an occupation with work tasks that cause musculoskeletal disorders and work disability. From the mental and social point of view, a high risk of stress, anxiety, depression and suicide has been also reported among farmers. Furthermore, farming work is associated with an environment of high occupational hazards, vulnerability to adverse climatic conditions and an increasing burden of cancers and chronic diseases. All of these factors contribute to seriously jeopardizing the work ability, health and quality of life of farmers.

Agriculture is a major economic sector in Iran and accounts for more than 25% of the country’s GDP, one-third of total employment and substantial export earnings, i.e., one-third of the country’s total non-oil exports. While agriculture has become more mechanized during the past decades, there are still many small farms in rural areas where most work operations are performed manually and under uncontrolled conditions. Working on these farms is characterized by poor work habits, lack of ergonomic practices, hazardous physical and chemical working conditions and poor health-care access.

Farmers’ occupational health services have been available since 2006 within health system in Iran. Although several surveys have been conducted on some of the safety and health problems among farming populations in recent years, little data is available on their work ability and health. In this context, the current study aimed to determine the work ability index and its relationship with dimensions of health among farmers working on small farms. To the best of the authors’ knowledge, the current research is the first study on the work ability index and health among Iranian farmers.

Materials and Methods

Setting and sampling

This cross-sectional study was conducted among male farmers working on small farms in rural areas located in central parts of Iran, Markazi province, Ashtian city. The health system in Iran is provided through a nationwide network with regulations of referral system. In rural areas, primary and secondary health care are rendered in Health Houses and Rural Health Centers (RHCs), respectively. Each RHC is designed to cover at least six Health Houses with a target population of about 9,000 people on average and is a village-based facility—usually located in a large village with better access to major roads. The main responsibility of RHCs is support of Health Houses, monitoring of their activities, acceptance of referrals from them and establishment of proper contacts with higher levels. The object of the occupational health services provided in Health Houses and RHCs is maintenance and promotion of the health status of farmers, carpet weavers and other workers in small-scale industries. The farmer’s health surveillance program includes monitoring workplaces, health examinations and health training by physicians, occupational hygiene technicians and community health workers, the so-called Behvarzan.

The current study was conducted during health examinations, and samples were selected from four RHCs covering 32 Health Houses. Based on records of the RHCs, the sample size was 1,115 male farmers. Of them, 210 subjects were needed to meet the objectives of the study. Moreover, due to attrition and an inability to make contact with some of the individuals, 355 subjects were chosen as participants in this study.

A two-stage cluster random sampling method was used to ensure a representative sample of all farmers. In the first stage, 10 Health Houses were randomly selected from a list including 32 Health Houses covered by four RHCs. In the second stage, selected Health Houses were visited, and 355 farmers were randomly invited to participate in the study. After
inviting the selected farmers to Health Houses and informing them about the aim of the current research, 294 (82.8%) individuals elected to participate in the study.

Survey instruments
In this study, data were collected on the basis of a face-to-face interview with each farmer. Information on work ability was obtained using the Work Ability Index (WAI) questionnaire, and the Short Form-36 (SF-36) generic questionnaire was used to measure the health status of farmers.

WAI questionnaire
The WAI questionnaire, a standardized tool, was used to assess perceived work ability27. The WAI is comprised of 7 items, including current work ability compared with the lifetime best (0–10 points), work ability in relation to the physical and mental demands in the present work (2–10 points), current number of diseases or injuries diagnosed by a physician (1–7 points), estimated work impairment due to diseases (1–6 points), sick leave taken in the last 12 months (1–5 points), personal prognosis for work ability 2 years from now (1, 4 or 7 points) and mental resources, referring to psychological attitudes and resources to do the job (1–4 points). The WAI is calculated by summing the points of each item. The possible range of WAI score is 7 to 49 points, and the WAI score is classified into the following four categories: 7−27, poor; 28−36, moderate; 37−43, good; and 44−49, excellent. According to previous studies10,13,14, subjects with a WAI score of 36 or lower were classified as having a low work ability, and subjects with a WAI score of 37 and above were classified as having a satisfactory work ability.

The validity and reliability of the Persian version of the WAI have been explored in a previous study29. The WAI score of 37 and above were classified as having a satisfactory work ability, whereas role limitation due to emotional health mainly correlate to mental dimensions of health status. The values of each dimension were analyzed according to the standard method of scoring and the SF-36 instructions, provided in the SF-36 guidelines. Validity and reliability of the Persian version of the SF-36 have been explored in a previous study30.

Ethical approval
The research protocol was approved by the Ethics Committee of the Tehran University of Medical Sciences. All farmers invited to participate in this study were informed about the objectives of the research and were asked to provide written consent prior to start of the study.

Statistical analysis
Statistical analysis was performed using the SPSS software package (version 16). Descriptive statistics were used to describe the characteristics of the study population. The effect of demographics variables on the WAI was investigated using the t-test and one-way ANOVA. Multiple linear regression analysis was used to test the association between the mean WAI score and each of the health dimensions.

Results
All of the participants were male farmers with a mean age of 51.1 yrs old (SD=15.1; range 18–82). Smokers accounted for 37.4% of the farmers, and 53.4% had a BMI exceeding 25. Table 1 summarizes demographic and other details of the studied population.

The mean WAI score was influenced by age (Table 2). However, smoking, BMI, sleep and rest statuses and type of job had no significant effect on the mean WAI score. The mean WAI score was 35.1 (SD=10.6), and the range was 8 to 49. According to the WAI categorical classification, most of the participants had a good (27.6%) or excellent (26.2%) work ability. The proportions of poor and moderate work ability were 22.4 and 23.8%, respectively. In total, 46.2% of the studied population was at the poor to moderate level (WAI<37).

The mean scores for the 8 scales of the SF-36 are presented in Table 3.

Table 4 presents the results of multiple linear regression analysis for the mean WAI scores by dimensions of health, adjusting for the effect of confounding demographic variables such as age.
The results showed that both physical and mental dimensions of health were significantly associated with mean WAI score. A high association was found for physical scales of health such as physical functioning (B=0.134, SE=0.018, \( p<0.001 \)), role-physical (B=0.052, SE=0.010, \( p<0.001 \)) and general health (B=0.093, SE=0.018, \( p<0.001 \)), whereas a lower association was found for mental scales such as mental health (B=−0.005, SE=0.023, \( p=0.044 \)) (Table 4).

### Discussion

The overall mean WAI for the farmer population in this research was 35.1 (SD=10.6), a moderate work ability level. According to the findings, perceived work ability was significantly influenced by both physical and mental dimensions of health.

In a study performed by Karttunen and Rautiainen\(^21\), the mean WAI score was 36 among female Finnish dairy farmers and 39 among male Finnish dairy farmers, both of which were higher than the mean WAI in this study. In comparison with recent research\(^10\) conducted among workers (mean age, 40.2 years old) of an Iranian petrochemical industry (mean WAI score, 39.1), the WAI score obtained for the studied farmers in the current research (mean age, 51.1 years old) was lower, as the subjects were, on average, more than 10 years older. However, studies of other populations have found higher WAI values than that in the current study when considering nature of jobs and age similarities. For instance, Finnish food industry employees\(^22\) (mean age of 62 years) had an average WAI of 37.3, and Belgian fire-fighters\(^23\) (mean age of 51.5) had an average WAI of 40.6.

In this study, the values obtained for WAI indicate that almost half of the farmers (46.2%) had a poor to moderate work ability. Some previous studies have also reported a high prevalence of unsatisfactory work ability among farmer populations. In a study conducted by Perkiö-Mäkelä\(^22\), it was found that 56% of the Finnish farmers in their study perceived their work...
ability as only moderate or poor. Further, among Finnish dairy farmers\(^{21}\), the proportion of low work ability scores was 39%. These results of the current research and other studies underline a high risk of disability and early retirement in this field and the necessity of identification and optimization of factors that can improve this situation.

Given the effect of health on WAI, statistically significant associations were found for physical and mental dimensions of health with the mean WAI score. The present results are consistent with most previous studies in terms of the effect of health on work ability, in both physically and mentally demanding jobs. For example, among office workers, a mentally demanding job, Martinez\(^{24}\) found that all dimensions of health were significantly associated with work ability. The study of Kiss et al.\(^{23}\) among fire fighters found that WAI was mostly influenced by age and health. Also, the study of Pohojnen\(^{25}\) performed among home care workers offers similar results. Furthermore, longitudinal studies conducted with over 11 years of follow-up in Finnish municipal service workers in different occupations show that among various variables, changes in health status have the greatest impact on work ability\(^{26}\). In the “work ability house model”, health status has been proposed as the basis for work ability\(^{7}\).

It is well known that functional limitations and diseases are highly predictive for work disability and mortality. In the current study, work ability was more influenced by dimensions of physical health such as physical functioning, role-physical limitation and general health. A possible reason for these findings could be related to the characteristics of the work, which was highly physically demanding. Literature reviews show that impairment of health is more intense in physical work\(^{24, 26, 28}\). Besides, physical health is considered more strongly correlated to work ability than mental health and is regarded as more related to jobs with predominantly physical requirements\(^{29}\). Based on this finding of the present study, it is suggested that the health care systems within the RHCs and Health Houses should be reviewed in both the studied area and throughout the nation, with the aim of developing a preventive attitude toward reducing physical work load.

Ageing occurs along with a progressive impairment of health and functional capacity\(^{3}\). In the current study, the WAI scores decreased as age increased. This finding is in line with previous studies conducted in physically demanding jobs\(^{6, 10, 23, 26}\).

Although in this study no significant relationship was found between the WAI values and others demographic variables such as BMI, smoking and sleep and rest statues, there are many reports of the negative effects of these factors on work ability\(^{6}\).

There were some limitations in this study. First, the cross-sectional design of the study does not allow for actual causative conclusions to be made. Second, we used self-reported measures in this study, and so it is possible that respondents did not provide correct information to the researcher for different reasons. Furthermore, an ergonomic analysis of the tasks was not conducted in this study to determine real differences in WAI between job groups, which can be considered another limitation of this study.

**Conclusions**

The mean WAI score of the studied population suggested an unsatisfactory work ability (WAI<37). On the basis of the WAI guidelines, improvement of work ability and identification of factors affecting it are recommended.

In this study, as the values obtained for WAI indicate that 27.6% of the study population had a good ability, it is necessary to take appropriate protective actions to elevate the level of work ability. Also, given the high proportion (46.2%) of practitioners

<table>
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<th>Dimensions of health</th>
<th>Unstandardized coefficients</th>
<th>Standardized coefficients</th>
<th>p value</th>
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<tr>
<td></td>
<td>B*</td>
<td>Std. Error</td>
<td>Beta</td>
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<td>Physical functioning</td>
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<td>Bodily pain</td>
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<tr>
<td>General health</td>
<td>0.093</td>
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*Adjusted for age (R-squared=0.732).
with low to moderate work ability scores, identification and optimization of factors that can improve this situation must become a priority in intervention and prevention programs.

The findings of the present study showed a statistically significant association of WAI scores with physical and mental dimensions of health. This fact underlines the importance of considering health in both its dimensions in the preservation and promotion of work ability.

According to the results of the present research, work ability was more influenced by physical scales of the health dimensions, such as physical function, role-physical limitation and general health, whereas a lower association was found for mental scales such as mental health. Hence, any interventional program for preservation and promotion of work ability among the studied farmers should be based on balancing and optimizing the physical and psychosocial work environments, with a special focus on reducing physical work load.

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