

# Investigating the Effect of Insomnia Severity on the Employees' Work Ability in Construction Projects

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## Abstract

**Background:** The work ability index (WAI) is a very important factor in planning a job and selecting suitable people for different occupations, and it can be affected by different factors. The aim of this study was to investigate the effect of insomnia severity on the employees' work ability in a construction project. **Methods:** This descriptive-analytical research has studied 213 employees of construction projects. Morin insomnia severity index (ISI) was used to evaluate the insomnia severity. Moreover, work ability was assessed using a questionnaire designed by the Finnish Institute of Occupational Health. Statistical data analysis was performed by SPSS19. **Results:** The mean age and working experience of the individuals were respectively 36.2 and 11.27 years. The mean and standard deviation of the insomnia severity index was 6.76(2.5). Multiple linear regression analysis showed that insomnia severity, marital status, type of employment, and smoking had a significant effect on work ability index (WAI); so that the mentioned variables explained about 24% of the WAI variance. **Conclusion:** Since sleep disorders and poor sleep quality can significantly decrease the work ability of employees, it is important to pay attention to sleep-rest programs to maintain and increase work ability and productivity.

**Keywords:** Work ability; Insomnia severity; Sleep disorder; Construction projects

## Introduction

At the moment, the costs imposed by inability to work are even more than the costs imposed by unemployment.<sup>1</sup> If the employees' physical and mental abilities do not match with their occupational needs, this situation will lead to safety and health problems, decreased production, and increased costs imposed by dismissal of the employees.<sup>2</sup> Work ability refers to the balance between the individual abilities and the job properties and it results from the interaction between the person and the workplace.<sup>3</sup> This factor is an indicator of the

quality by which the individuals can use their capabilities.<sup>4</sup> A low level of work ability is accompanied by decreased productivity, the risk of early retirement, and long term absence caused by illness and disability. So, retention and promotion of the employees' work ability is done aiming to increase productivity and prevent their early dismissal from the work, especially in occupations requiring a high level of ability.<sup>5</sup> Since work ability is considered a factor involved in increasing the organization's efficiency, it is so important for the managers to properly evaluate

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the employees' work ability due to economic considerations.<sup>2</sup> Therefore, there has been an increasing need to work ability evaluation as a part of the quality management system of different sectors.<sup>6</sup> In this regard, it is necessary to preserve the work ability during the working time, promote that to an efficient level, and identify the factors affecting that.<sup>7</sup>

According to the previous studies, the main factor affecting the work ability include: occupational factors, health status, lifestyle, and physical activities.<sup>1, 5, 8</sup> Also, some of the individual factors such as aging, weight gain, and decreased health<sup>1, 8, 9</sup> can affect work ability. So, it can be stated that a low level of work ability can predict the existence of a disease, absence, and disability.<sup>10</sup> So, recognizing the factors predicting the work ability can provide solutions for its retention and promotion and decreasing the employees' motivation for leaving their job.<sup>3</sup> According to studies, one of the factors causing unfavorable results such as absence from work and incident is the employees' sleep disorder that is a common problem affecting the quality of life and efficiency.<sup>11</sup> Several studies have shown that insomnia can decrease the physical and mental performance by causing fatigue, anxiety, and inability to perform the complex tasks, decreasing the professional progression and job satisfaction, and increasing the employees' absence.<sup>12</sup>

People suffering from insomnia usually experience a significant decrease of the quality of life and their ability to cope with problems. Although it has been proved that inadequate sleep leads to significant direct and indirect economic costs, the relationship between sleep disorders and the employees' work ability has not been paid enough attention.<sup>13</sup> Regarding the importance of retention and promotion of work ability in the employees and the effects of the working conditions and environment on this variable especially in challenging environments such as construction projects as one of the risky jobs<sup>14, 15</sup> and the research gap in this area, the present research aims to investigate the work ability of the workers of

construction projects and also the effect of individual and occupational variables and sleep disorders on this issue.

## Methods

This cross sectional study has investigated 213 male workers working in construction projects of one of the large civil construction companies of the country. The samples were selected by convenience sampling out of the people with an at least one-year background of working in the studied projects. In the first step, data collection was done by a semi-supervised self-report approach. For this purpose, a multi-section questionnaire was distributed among the participants. The first part of the questionnaire included the items assessing the demographic and occupational variables. The second part evaluated the work ability index (WAI). This tool can predict the respondents' inability in the future, and it can predict the variation of work ability in different occupational groups with a high reliability.<sup>16</sup> In Iran, Mazloumi et al have evaluated the reliability and validity of this tool (7).<sup>17</sup> In WAI scale, the score assigned to each participant ranges between 7 and 49 and the subjects are evaluated in four groups:<sup>18</sup>

- Poor work ability: 7-27
- Medium work ability: 28-36
- High work ability: 37-43
- Excellent work ability: 44-49

In the third part of the questionnaire, sleep disorders are evaluated based on Morin insomnia severity index (ISI) (1993) that measures the person's perception of insomnia severity.<sup>19</sup> Insomnia severity index (ISI) includes 7 questions, and the participants specify their perception of the articles based on a five-point Likert scale (0=never, 5=so frequently). The total scores range from 0 to 28, and the higher scores indicate a higher perception of insomnia. The total scores of 0-7 are considered as clinically insignificant (normal); the total scores of 8-14 are considered lower than the clinical

threshold (mild insomnia); the total scores 15-21 indicate a moderate insomnia; and the total scores of 21-28 indicate a severe insomnia. Reliability of the Persian version of this questionnaire was obtained as 0.72 (Cronbach's alpha).<sup>20</sup> In the second step, the data obtained from the questionnaires and also the demographic data were analyzed by SPSS 19 software using descriptive statistical tests such as paired t-test, correlation, multiple linear regression, and logistic regression.

## Results

Out of the 250 filled questionnaires, 213 complete questionnaires were analyzed and the defective questionnaires were excluded from the study. So, 213 male workers with the average age of 36.2 years (9.37), the average working background of 11.27 (7.76) years, and the average BMI of 25.89 (2.89) participated in the study. Among the participants, 17.4% were single, 5.2% were smokers, and 4.2% were affected by one or more chronic lifestyle-related diseases. Table 1 presents the other individual and occupational information.

According to the obtained data, the least value of insomnia severity index (ISI) was equal to zero and the highest value was equal to 22 with the mean (SD) of 6.67(5.2). Among the participants, 62.4% did not report any significant insomnia, 26.3% reported a mild insomnia, 10.3% reported a moderate insomnia, and 0.9% reported a severe insomnia. The least value of WAI was reported as 23 and the highest WAI was reported as 49 with the mean(SD) of 42.73(5.43). Among the participants, 5 people (2.3%) reported a poor WAI, 24 people (11.3%) reported a medium level of WAI, 80 people (37.6%) reported a good WAI level, and 104 (48.8%) reported a quite favorable WAI level.

Statistical analysis of the relationship between WAI and age, BMI, marital status, education level, health status, smoking, and using drug showed that among the studied groups (less than 26, 26-35, 36-45, and more than 45), WAI values were only

significantly different between the two groups of less than 26 and 36-45 years that have reported the highest values of this variable among the four age groups. Also, a significant relationship was found between WAI and smoking and marital status; so the non-smokers and married subjects reported a higher WAI. However, no significant relationship was found between WAI and BMI, education, health status, and using drug.

According to the statistical analysis of the relationship between WAI and occupational variables, there was a significant relationship between WAI and working background and the type of employment; so that the employees with a working background of less than 6 years, 6-10 years, and temporary employees reported a higher WAI. Meanwhile no significant relationship was found between WAI and the number working days and shifts.

After checking the homogeneity of variance, comparison of WAI in different groups of insomnia severity was done by Kruskal-Wallis analysis. So, as seen in table 2, the statistical analyses have suggested a significant relationship between WAI and sleep disorders evaluated by insomnia severity index (ISI).

**Table1.** Descriptive statistics of the qualitative variables

Qualitative variables		Frequency	Frequency percentage
Education level	Lower than a high school diploma	53	24.90
	High school diploma	55	25.80
	Academic education	105	49.30
Exercise	Never	57	26.80
	Sometimes	21	9.90
Occupational group	Regularly	135	63.40
	Worker	140	65.70
Employment type	Administrative employee	73	34.30
	Permanent or contract-based	9	4.20
Working shift	Temporary	204	95.80
	Morning	154	72.30
	Evening	3	1.40
	Night	13	6.10
	Rotational	43	20.20

**Table2.** Comparison of WAI between different groups of insomnia severity

ISA	Mean (SD)	Chi-square	P-value
Insignificant insomnia	44.41(4.54)	**38.2894	0.001<
Mild insomnia	39.81(4.77)		
Moderate and severe insomnia	40.2(7.43)		

\*\*significant at the level of 1%

**Table3.** The simultaneous effect of the research variables on WAI

Predictor	Non-standard coefficient	Standard error	Standard coefficients	t	P-value
ISI	-0.373	0.065	-0.357	-5.77	0.001
Smoking	-5.089	1.470	-0.208	-3.46	0.001
Employment type	4.698	1.630	0.174	2.89	0.004
Marital status	2.412	0.888	0.169	2.72	0.007

In the next step, multiple linear regression analysis was used to investigate the simultaneous effect of the studied variables on WAI eliminating the effect of the intervening variables. The results are presented in table 3.

According to the results of multiple linear regression analysis, the variables of insomnia severity, marital status, employment type, and smoking had a significant effect on WAI and they could explain about 24% of the variance of WAI.

## Discussion

Sleep disorder can affect most of the physical and mental activities.<sup>21</sup> Investigation of the sleep disorders based on insomnia severity index (ISI) in this study suggests that about 62.4% of the subjects have got an acceptable score of sleep quality and they are not affected by insomnia. Moderate and severe insomnia were respectively observed in 10.3 and 0.9 of the subjects. This observation can be due to the fact that 72.3% of the people do not work in a shift-based manner. Moreover, this index is also affected by other individual and occupational factors. In this study, limited smoking (94.8%), normal health status (95.8%), and regular exercise (63.4%) have been reported as some of the factors creating a good

sleep. According to the results of the study, the mean and standard deviation of WAI were reported as 42.73(5.43); the values suggest that most of the subjects have got a good and excellent score of WAI. One of the factors explaining this finding is the employees' average age (36.2 years); so that most of the subjects have an adequate working experience and they have gained enough experience to express a favorable performance.

Also, the results showed a significant relationship between WAI and the perceived insomnia severity. This relationship suggests that the subjects with a bearable insomnia severity have got a higher score of WAI, and adequate sleep can improve the persons' ability to perform their tasks. Although no study has so far investigated the effect of insomnia severity on the employees' work ability in construction projects, similar studies performed in other workplaces approve the results of this study. A study investigating the workers of Chinese industries showed that insomnia has a significant effect on work ability and decreased time of sleeping can significantly decrease the workers' work ability.<sup>12</sup> Another study investigating the daily workers and the shift workers of industrial sectors showed that decrease of the time of sleeping can significantly decrease WAI and this effect takes place by the changes in circadian rhythm.<sup>22</sup> A four-year cohort study reported that insomnia severity is one of the strongest predictors of disability and its effect remains constant by controlling the duration of sleeping and other intervening variables.<sup>13</sup> Other similar studies performed in other workplaces have investigated the effect of other sleep disorders on work ability, and their findings approve the results of this study.<sup>11, 23, 24</sup> Several studies have reported the effect of sleep disorders and duration on neurobehavioral functions, metabolic diseases, anxiety, cardiovascular diseases, and mental diseases; all of these complications can decrease the work ability.<sup>12</sup>

According to the results of the present study and similar studies, sleep disorders and insomnia severity besides other individual and social factors can decrease the work ability. In general, different sleep disorders can affect the work ability regardless of the type of the disorder and the measurement scale. Sleep disorder is an effective factor in the person's overall performance (physical and mental functions).<sup>25</sup> On the other hand, sleep disorders can increase the unsafe behaviors<sup>26</sup> and human errors,<sup>27</sup> and consequently the probability of incidents.<sup>28</sup> It can be claimed that the relationship between sleep disorders and the occurrence of incidents can be mediated by work ability; this assumption can be investigated in future studies. As already stated, the present research is a cross sectional study investigating the effect of insomnia severity on work ability; it can be considered as one of the research limitations. Furthermore, all the variables were evaluated in an objective manner based on a questionnaire and a self-report approach; Whereas, future studies can be performed by more precise tools such as clinical and objective methods for evaluating the dependant and the independent variable. The strength of the research is that the effect of some of the intervening variables has been observed in data analysis and their effect has been eliminated. Meanwhile, this study has investigated the employees of construction projects as one of the risky jobs for this first time.

## Conclusion

According to the results of this study and relevant studies, WAI is affected by many factors especially lifestyle-related factors and social-mental variables. It seems that sleep disorders and low quality of sleep can significantly decrease the work ability. As a result, the affected performance and the increased probability of unsafe behaviors can decrease the organizations' productivity. In order to promote this index (WAI) and the organizations' productivity even in non-shift working organizations, it is suggested to pay attention to the

employees' rest as a priority in achieving a higher productivity.

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