A study on the relationships between age, work experience, cognition, and work ability in older employees working in heavy industry

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Abstract. [Purpose] The purpose of this study was to examine the correlation of age, work experience, cognition, and work ability in older employees working in heavy industry. [Subjects and Methods] The study was conducted using 100 subjects who were over 55 years old and worked in heavy industry. To obtain data, we first had the subjects complete the MoCA-K test and Work Ability Index (WAI). The data were then analyzed by frequency and correlation using statistical software (SPSS 21.0). [Results] Through this study, we discovered a significant positive correlation between WAI and MoCA-K, age, and work experience. [Conclusion] This study revealed that work ability in older employees increases not with the number of years worked but with the enhancement of cognitive ability. Special management that focuses on cognition is therefore required for senior employees working in the field of heavy industry.

Key words: Age, Cognition, Work ability

INTRODUCTION

The International Labor Organization (ILO) has estimated that by the year 2025, the proportion of individuals over the age of 55 will be 32% in Europe, 30% in North America, 21% in Asia, and 17% in Latin America. The Republic of Korea in particular, is already experiencing this ageing of its population; in 2010, individuals aged 65 and older accounted for 11.3% of the total population5). In 2018, the nation is expected to become an aged society, with the elderly making up 14.3% of the population, and in 2060, the nation is projected to enter the class of a super-aged society, with the elderly population at 20.8%. This trend is predicted to continue, and the elderly population is expected to comprise 24.3% of the total in 2030 and 40.1% in 20605). As a result of the aging population in the Republic of Korea, the economic participation rate of aging workers, who have been defined by the World Health Organization as those aged 45 or older, increased by an average of 47% from 1998 to 2007. Even more dramatically, the participation rate of the elderly, defined by the Welfare of the Aged Act as those 65 or older, increased to about 82% within this time5).

As workers age, their physical and mental abilities tend to decline, and, accordingly, the occurrence of accidents and diseases within workers increases as they age5). Therefore, work ability evaluations and the systematic management of elderly workers are necessary. The term work ability has been used since the 1980s, beginning with several research and praxis-oriented projects completed in Finland. The basis for measuring work ability was also established in the early 1980s in a follow-up study of ageing municipal employees5).

Research on the correlation between work ability and age has been consistently conducted, but mainly in Europe. The results of a study completed at an early stage of this research, which were confirmed in later studies, show that when people reach a certain age, their work ability significantly decreases6). According to further research, as workers continue to age, their work ability continues to decrease7, 8). However, there are also contrasting study results. For example, the differences in physical ability among...
elderly workers (aged 50 or older) are relatively smaller than those among young workers (aged 39 or younger); in particular, the former can maintain certain physical abilities to perform essential tasks.<sup>9</sup> Accordingly, the aim of the present study was to investigate the work ability of workers aged 55 or older working in heavy industry and to examine the correlations between their ages, the numbers of years they worked, and their cognitive abilities.

**SUBJECTS AND METHODS**

This cross-sectional study was performed among employees of a heavy industry in the Republic of Korea. Participation in the study was voluntary, and it involved completing an anonymous survey. This study complied with the ethical standards of the Declaration of Helsinki. A total of 100 subjects participated, and all were workers above 55 years of age working in heavy industry in the Ulsan area. Before the study, the principal investigator explained all the procedures to the subjects in detail. Cognitive and work abilities were evaluated using several research tools; the cognitive ability evaluation utilized the Korean version of the Montreal Cognitive Assessment (MoCA-K) tool, while the work ability evaluation employed the Work Ability Index (WAI) tool. The collected data were analyzed using SPSS 21.0 for Windows to gain frequency and correlation coefficients.

**RESULTS**

The general characteristics of the participants are shown in Table 1. The group of participants was comprised of 99 males (99.0%) and 1 female (1.0%). The mean age was 57.80 years old (SD=1.746; range 55–60). The mean work experience was 32.66 years (SD=3.691; range 20–40). Regarding work experience, 3 participants (3.0%) had under 25 years of experience, 24 participants (24.0%) had under 30 years of experience, 37 participants (37.0%) had under 35 years of experience, and 26 participants (26.0%) had under 40 years of experience. When measuring cognition, using the MoCA-K test, 79 participants (79.0%) were at a normal level, and 21 participants (21.0%) were at an MCA level. The mean MoCA-K score was 24.04 (SD=3.022; range 12–29). Finally, regarding work ability, the WAI test showed that 18 participants (18.0%) were at the excellent level, 55 participants (55.0%) were at the good level, 25 participants (25.0%) were at the moderate level, and 2 participants (2.0%) were at the poor level. The mean WAI score was 39.41 (SD=4.470; range 26–48).

An analysis of the relations of age, years of work experience, cognitive and WAI scores revealed some similarities among all these factors. For instance, the mean age of the participants was 57.80 years old, and the mean years of work experience was 32.66 years; this study found that as age increases, work experience also increases (p<0.01, correlation coefficient: 0.31). Further, the higher the MoCA-K test result, the higher the WAI level of an employee (p<0.05, correlation coefficient: 0.21) (Table 2).

**DISCUSSION**

The mean cognitive ability based on the MoCA-K test was 24.04, indicating a normal level, and the mean work ability based on the WAI test was 39.41 points, indicating the good level. According to the results of the correlation analysis of workers' age, number of years of service, cogni-

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**Table 1. General characteristics of survey participants**

| Category      | Frequencies (%) | Range  | Mean (SD) |
|---------------|-----------------|--------|-----------|
| Gender        |                 |        |           |
| Male          | 99 (99.0)       |        |           |
| Female        | 1 (1.0)         |        |           |
| Age (yr)      |                 |        |           |
| 20–25         | 100 (100.0)     | 55–60  | 57.8 (1.7) |
| 26–30         | 3 (3.0)         |        |           |
| 31–35         | 24 (24.0)       |        |           |
| 36–40         | 26 (26.0)       |        |           |
| Work Experience (yr) |       |        |           |
| 20–25         | 79 (79.0)       |        |           |
| 26–30         | 21 (21.0)       |        |           |
| 31–35         | 18 (18.0)       |        |           |
| 36–40         | 55 (55.0)       |        |           |
| MoCA-K Normal (≥23) | 25 (25.0)       |        |           |
| MoCA-K MCI* (<23) | 2 (2.0)        |        |           |
| WAI Excellent (44–49) | 18 (18.0)       |        |           |
| WAI Good (37–43) | 55 (55.0)       |        |           |
| WAI Moderate (28–36) | 26–48  |        | 39.4 (4.5) |
| WAI Poor (7–27) | 2 (2.0)        |        |           |

*Mild cognitive impairment (MCI)

**Table 2. Correlation analysis of age, work experience, and cognitive and WAI scores**

|                | Age | Work experience | MoCA-K | WAI |
|----------------|-----|-----------------|--------|-----|
| Age            | 1   |                 |        |     |
| Work experience| 0.31**| 1               |        |     |
| MoCA-K         | 0.02| -0.03           | 1      |     |
| WAI            | 0.09| 0.14            | 0.21*  | 1   |

*p<0.05; **p<0.01
tive ability, and work ability, there was a strong correlation between workers’ age and number of years of service. However, there was no significant correlation between workers’ age and cognitive function or work ability. In addition, work ability had a positive correlation with cognitive function, but there was no significant correlation between work ability and age or number of years of service. Although it cannot be said that older workers with more experience always have a higher work ability, work ability tends to increase as cognitive ability improves. According to a study conducted by Salthouse (1997), the positive effects of job experience can be directed towards basic cognitive processes or job performance. Finally, it is worth noting from these previous studies that older workers were at least as productive as younger workers; the results for the different age groups were found to be the same in jobs demanding skill and speed.

Although this study offers many contributions to the understanding of the relationships between age, work experience, work ability, and cognitive ability, there is an opportunity to further study these relationships. In particular, differentiating general cognitive function and field-specific cognitive function and examining the relationships of each of these to work ability could further elucidate the findings of this study. Additionally, as elderly workers’ work ability could be enhanced through programs that help them to improve cognitive function, further research should be conducted to investigate both current work ability and work ability that has been complemented by cognition-improvement strategies to reveal whether such strategies do enhance work ability. Introduction of programs to improve cognitive function that have been adjusted to be suitable for elderly workers should certainly be considered not only to maintain and enhance the work ability of individual workers but also as a method of managing elderly workers in an aging society. Finally, a utilization of strategies to ameliorate the cognitive function of workers through experience could be beneficial.

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