Association between Primary Lifetime Occupation and Cognitive Function in Elderly Koreans

고령 인구에서 주요 직업과 인지기능의 연관성

2012 년 8 월

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이 논문을 보건학 석사 학위논문으로 제출함
2012년 4월

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이효림의 석사학위논문을 인준함
2012년 8월

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Abstract

Association between Primary Lifetime Occupation and Cognitive Function in Elderly Koreans

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Background: This study analyzes which cognitive function is preserved through primary occupation in elderly people and examines the association between cognitive ability and primary occupation with the K－MMSE test. The result from this study may suggest considerations for providing jobs for the elderly people since if we know preserved cognitive function in people after retirement, it might be helpful to provide new job that is appropriate to them.

Method: This study used subjects from KLoSA aged over 55 years and the total study population is 3,985. Regression was performed to identify the association between K－MMSE sub－scores and primary occupations. Adjustment was made for confounders such as gender, age, marital status, education level, depression, smoke, and income in the analysis.

Results: Manager/professionals as primary occupation showed higher scores at memory, language, and spatiality domains, while service/sales workers had high scores at language section. Elementary workers showed better scores at command domain. When this study analyzed the complexity of job with data,

people, and thing, the data group showed higher scores at memory, language, and spatiality domains. Also white collar had better scores at language and spatiality section than blue collar. **Conclusion:** This study reflects a relationship between primary lifetime occupation and cognitive ability in elderly people. People who did mental work or treated data showed better ability at memory, language and spatiality, and workers who engaged at relationship with other people showed better ability at language. Hence, investigation of the primary lifetime occupation may suggest a standard of which cognitive ability is developed and preserved in elderly people.

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Chapter Ⅰ. Introduction

1. Background

People spend most of their lives accomplishing different tasks in different jobs. Specific tasks which are required at work needs a person's specific cognitive function to carry out that task. Different cognitive function would be needed because various occupations treat different work specially. For that reason occupational tasks that people attend to improve specific cognitive function by constant use and they show better cognitive function than those who are not trained in that field. Cognition can be defined as "mental processes including attention, remembering, producing and understanding language, solving problems, and making decisions." (B 1999). It can be considered that cognitive function which was formed during primary lifetime occupation would be preserved after retirement and that can be verified by the association between occupation and cognitive function test.

Several studies have examined the association between lifetime occupation and cognitive function. (Andel, Kareholt et

al. 2007). Schooler et al posits that occupational complexity promote cognitive function by motivating workers to employ cognitive function that is required on a daily basis. They also suggested that the complexity of works improve intellectual flexibility and facilitates stable cognitive ability in older workers. (Schooler, Mulatu et al. 2004). Also another study found that a post-educational training on the job positively affects cognitive ability and emphasized that complexity of occupational environment may have an important role in preservation of cognitive ability in the elderly population (RG, CS et al. 2002). Also, jobs demanding high mental ability was associated with a low risk of cognitive impairment (Bosma, van Boxtel et al. 2003) and Smyth et al said that people who work in jobs demanding high physical activity and low mental work were more likely to be associated Alzheimer's disease. (Smyth, Fritsch et al. 2004). Stern et al found that demands of interpersonal relationships in primary occupations delayed the onset of Alzheimer's disease regardless of age and education level. (Stern, Alexander et al. 1995). Moreover, high job control was associated with greater cognitive ability and lower possibility of impairment when low job control show more possibility of cognitive impairment (Andel, Crowe et al. 2011).

The relationship between intellectual performance and cognitive function might be explained by the expression "use it or lose it". Because daily execution of tasks provide intellectual stimulation that play a role to maintain and improve cognitive function.(Katzman 1995). Accordingly, continued cognitive activities at work might delay or even prevent cognitive impairment in to old age.

Socioeconomic status can be seen by the characteristics of occupation in which people spent the majority of their time. There are jobs demanding high mental ability and carry out sophisticated tasks, but on the other hand, there are jobs requiring simple physical labor. One study showed that people who had occupation of a low socioeconomic position displayed cognitive impairment during their later stage of life when compared with people who had higher socioeconomic occupation. (Kaplan, Turrell et al. 2001). Hence, occupation as an important indicator of socioeconomic status is also considerably useful for predicting the risk of cognitive impairment after retirement. (Li, WU et al. 2002)

There is the function of retirement in the association between cognitive ability and occupational complexity. (C 1984) One study found that low routine and complex job in the work

environment maintained stable cognitive ability. Retirement seemed to have an adverse consequence on cognitive change in individuals who had had more complex occupation compared with those who had had more routine works. (KW 2005)

To examine the cognitive function of elderly after retirement, there is a tool developed by Folstein et al. in 1975 called mini-mental state examination (MMSE), and Korean version of the MMSE also exists (K-MMSE). This widely used, quick and easy screening tool measures cognitive function and the validity and reliability of predicting moderate- and serious- level of dementia have been shown (강연욱, 나덕렬 et al. 1997).

Nowadays the Korean society is characterized by increasing life expectancy, continued economic development, and decreasing birth rate. (MOHW 2002) Also, Korea became an ageing society in 2000, as the proportion of those 65 or older reached 7% of the population. Subsequently the country is expected to suffer a rapid ageing procedure. Korea was slow compared to other countries in reaching the ageing society, but it is anticipated to grow to be a super-aged society at about the same time as other developed countries (Institute). With these aging societies, the re-employment of the elderly people in the workforce is an important issue. According to the '2010

Statistics Korea' (2010년 통계청 경제활동인구조사 고령층 부가조사), people over the age of 55 wanted to have a job because of economic reason and for enjoyment of working. Therefore, the Korean Ministry of Health & Welfare tried to provide a chance for the elderly people to participate in social activities (강성희 2011) and provide adequate jobs to elderly people in order to stabilize their life psychologically and socially (Shim 2002).

Therefore, in this study, the aim is to examine the association between K-MMSE scores and primary lifetime occupation in elderly Korean population.

2. Objective

In order to provide adequate jobs for elderly people, it is helpful to understand their specific cognitive ability which would have remained after retirement. Old people who had retired may have learned specific cognitive function which is suite their primary occupation.

Exposure to complex job environment make people practice cognitive function and facilitates cognitive skills (Finkel, Andel et al. 2009). In addition, primary occupation during lifetime is related to global cognitive function and that can be measured by the mini mental state examination (Helmer, Letenneur et al. 2001).

This study analyzes which cognitive function is preserved through primary occupation in elderly people and examines the association between cognitive ability and primary lifetime occupation with the K-MMSE test. Also, the complexity of job and job-based socio-economic status with K-MMSE scores will be observed. The result from this study may suggest considerations for providing jobs for the elderly people.

Chapter Ⅱ. Methods

1. Study population

This study used data from the Korean Longitudinal Study of Aging (KLoSA), which is conducted every two years starting from 2006. Survey subjects include approximately 10,000 middle- and old-aged people who are more than 45 years old living in Korea excluding the Jeju Island. The KLoSA survey method is done by Computer Assisted Personal Interviewing and topics are consisted of demographics, family, health, employment, income, assets, subjective expectations and satisfaction.

KLoSA allows the implementation of effective social and economic policies that focuses on trends that arise in the process of population aging by providing the necessary information. The data from KLoSA also might help identify different magnitude of an aged society, provide datasets that enable studies in different areas, and produce data comparable with similar panel studies in other countries that can suggest the basis for academic studies and policy-making.(Institute)

This study used the 2008 KLoSA data and focused on elderly people who might have retired from their work or are considered as having their cognitive function formed during their primary occupation. According to the previous study which used Korean census results (통계청 조사) retired people over the age of 55 years in Korea are considering re-employment, (강성희 2011) and so this study also used the age of 55 years as a cut-off, and therefore, the total population in this study is 3,985.

2. Primary occupation

ⅰ) Primary occupation

This study defined primary occupation according to the KLoSA survey data. KLoSA used the Korean Standard Classification of Occupations (KSCO) to categorize occupations of respondents, and the KSCO was developed based on the International Standard Classification of Occupations (ISCO) by the ILO (International Labor Organization). Employment section in KLoSA has ten categories of occupation classified as managers, professionals/associate professionals, clerks, service workers, sales workers, skilled agriculture/forestry and fishery workers,

craft and related trades workers, plant/machine operators and assemblers, elementary works, and armed forces. A separate job history data surveys the time of each job an individual had as duration, and how frequently they changed their jobs. To define primary occupation, each person's longest duration of occupation was investigated using the job history data (Karp, Kareholt et al. 2004). As job history data has all the information about each person's every past occupation including the period, it was possible to collect primary occupation. After that this study classified the ten job categories into five groups with similar characteristics in occupation. The five groups are: i) manager/professionals, ii) service/sales workers, iii) machinery/technicians, iv) elementary workers, and v) skilled agriculture/forestry/fishery workers. Those that were found as managers and professionals/associate professionals, and clerks as their primary occupation in the ten job categories were grouped as i) manager/professionals, while service workers and sales workers were classified as ii) service/sales workers. Craft and other related trade workers, plant/machine operators and assemblers were grouped under iii) machinery/technicians, whereas elementary workers and skilled agriculture/forestry and fishery workers were categorized two other groups. Armed

forces were excluded because there was only one person.

ii) The complexity of work

The measure of complexity of work included three specific dimensions—complexity of work with data, people, and things (Andel, Kareholt et al. 2007). Specifically, complexity of work with data category included managers and professionals/associate professionals, and clerks. Complexity of work with people category included sales/service worker and complexity of work with things category include machinery/technicians, elementary workers and skilled agriculture/forestry and fishery workers.

iii) Job based SES

This study classified all occupation groups into two main categories. High socioeconomic occupation can be defined as white collar which includes manager, professionals/associate professionals and clerks, while low socioeconomic occupation is defined as blue collar including skilled agriculture/forestry/fishery workers, machinery/technician workers, and elementary workers (Ji-whan 1991). For this classification method, sales and service-related workers were

excluded (n=662).

3. Cognitive function score

This study used the Korean version of the Mini-Mental State Examination (K-MMSE). K-MMSE is a Korean version of mini mental state examination (MMSE) which was developed by Folstein et al. (1975) K-MMSE is a 30-point questionnaire instrument and is most widely used to screen for cognitive impairment and cognitive performance. It is generally used to screen for dementia but is also used to measure the severity of cognitive dysfunction (Bour, Rasquin et al. 2010). Therefore the MMSE is widely used as a cognitive function instrument not only in clinical situations but also in research settings because of its briefness and straightforward organization (Guerrero-Berroa, Luo et al. 2009). The MMSE was translated into Korean by Kang et al. (1997) and the K-MMSE has been widely used in clinical evaluations and research in Korea (Han, Jo et al. 2008) K-MMSE comprises thirty items providing information about orientation to time (5) , orientation to place (5), registration (3), attention and calculation (5), recall (3), language (5), complex command (3) and spatiality (1).

K-MMSE shows high sensitivity (0.7~0.83) and internal reliability (alpha=0.84) (강연욱, 나덕렬 et al. 1997). Also MMSE has been shown to detect Alzheimer's disease in mild cognitive impairment (MCI) patients with a negative prediction value of 93.93% and a positive prediction value of 80.95% (Pozueta, Rodriguez-Rodriguez et al. 2011). Therefore K-MMSE is an appropriate instrument to identify which cognitive function is well preserved and which is diminished in the elderly.

This study categorized K-MMSE domains as orientation (orientation to time and orientation to place), memory (registration and recall), attention, language, command, and spatiality for analysis.

4. Demographics

Marital status

KLoSA survey data has information about current marital status and there are five categories as currently married or living with a partner, separated, divorced, widowed or missing, and never married. This study focused on whether living with a partner or living without partner is an important factor in cognitive function. Therefore, this study classified the five categories into two major categories as 'living with partner' (currently married or living with a partner) or living without partner' (separated, divorced, widowed, missing, and never married). Data regarding whether subjects live with their children were not available for the current study.

Educational background

Information about educational background in the KLoSA survey data was classified as less than elementary school, middle school, high school, college lever of higher. This study classified all education level into three core categories: six years of elementary school, seven to twelve years of intermediate (middle and high school) levels, and more than

thirteen years of college level to see the effect of educational status.(Han, Jo et al. 2008)

Age

This study cut the age off at 55. Although the official retirement age in Korea is about 60 years old, previous study found that old people aged over 55 were looking for jobs after their retirement. Therefore this study also considered the population's age of 55 and over. (박경숙. 2006)

Income

This study defined the income variable as the individual total income for the last one year, which was obtained from KLoSA, and categorized total income into 'high', 'high middle', 'low middle', and 'low' quartiles. The unit of income measures was 10,000-Korean Won and there was 325 data missing.

Depression and smoke

This study considered people who suffered from depression and smoke as a confounding that might affect cognitive ability in elderly ((Singh-Manoux, Akbaraly et al. 2010)

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5. Statistical analysis

This study combined three separate datasets for analysis. The main dataset of KLoSA was merged with the dataset of job history and another data that included total income information according to ID of subjects. Descriptive analyses were performed by t-test and ANOVA to identify difference between cognitive function domains (orientation, memory, attention, language, command, and spatiality), and categories of independent variables. Logistic regression analysis was used to determine, firstly, the relationship between cognitive function domains and primary occupations, secondly, the relationship between cognitive function domains and complexity of work with data, people, and thing, and thirdly, the relationship between cognitive function domains and job based SES.

All statistical analyses were conducted using SAS 9.2, with a 0.05 level of significance.

Chapter Ⅲ. Result

1. General characteristics

Table 1 shows the general characteristics between demographics and K-MMSE scores. K-MMSE average scores were significantly higher in males than females in all K-MMSE domains. As age increases, average K-MMSE scores are decreased and with education levels, K-MMSE scores are higher as education levels are high. This is in concordance with previous studies that found people who are younger and have higher education show better ability in every part of cognitive domains (Ganguli, Snitz et al. 2010). Table 1 also showed that people who lived with their partners have higher scores than those who lived alone. Whether people have depression or not, the K-MMSE scores were different as people who have depression showed lower K-MMSE scores. There were more non-smokers than current smokers and this study showed smokers' K-MMSE scores were higher than nonsmokers. The group which earned more annual income showed better K-MMSE scores over all domains.

Table 1. Characteristics between general demographics and K-MMSE components (n=3,985)

Variables	N	Orientation(/10)		Memory(/6)		Attention(/5)		Language(/5)		Command(/3)		Spatiality(/1)	
Gender			<.0001		<.0001		<.0001		<.0001		<.0001		<.0001
Male	1734	9.43 (1.35)		4.43 (1.50)		3.81 (1.52)		4.53 (0.76)		2.34 (0.83)		0.77 (0.42)	
Female	2251	8.98 (1.78)		4.02 (1.69)		2.89 (1.88)		4.15 (0.98)		2.14 (0.92)		0.57 (0.49)	
Age			<.0001		<.0001		<.0001		<.0001		<.0001		<.0001
55-60	935	9.71 (0.90)		4.92 (1.15)		4.01 (1.39)		4.68 (0.55)		2.58 (0.67)		0.85 (0.35)	
61-66	902	9.58 (0.96)		4.62 (1.33)		3.79 (1.51)		4.53 (0.71)		2.45 (0.73)		0.78 (0.42)	
67-73	1091	9.28 (1.41)		4.15 (1.56)		3.27 (1.74)		4.34 (0.84)		2.22 (0.85)		0.65 (0.48)	
74-98	1057	8.24 (2.25)		3.25 (1.79)		2.25 (1.86)		3.77 (1.11)		1.73 (1.01)		0.39 (0.49)	
Marital status[1]			<.0001		<.0001		<.0001		<.0001		<.0001		<.0001
Living without partner	1062	8.57 (2.10)		3.56 (1.79)		2.44 (1.93)		3.89 (1.07)		1.93 (0.99)		0.46 (0.50)	
Living with partner	2923	9.40 (1.34)		4.43 (1.49)		3.60 (1.62)		4.47 (0.79)		2.33 (0.83)		0.73 (0.44)	
Education level			<.0001		<.0001		<.0001		<.0001		<.0001		<.0001
≤6 yeas	2399	8.85 (1.86)		3.76 (1.69)		2.74 (1.85)		4.06 (1.00)		2.03 (0.94)		0.51 (0.50)	
7< years ≤12	1318	9.64 (1.03)		4.81 (1.26)		4.05 (1.36)		4.68 (0.60)		2.50 (0.73)		0.86 (0.35)	
≥ 13 years	268	9.75 (0.65)		5.10 (1.12)		4.44 (1.01)		4.77 (0.44)		2.69 (0.58)		0.96 (0.19)	
Depression			<.0001		<.0001		<.0001		<.0001		<.0001		<.0001
Yes	322	8.4 (2.28)		3.64 (1.74)		2.56 (1.85)		3.90 (1.10)		1.87 (0.98)		0.46 (0.50)	
No	3663	9.24 (1.53)		4.25 (1.60)		3.36 (1.77)		4.35 (0.89)		2.26 (0.88)		0.68 (0.47)	
Smoke			<.0001		<.0001		<.0001		<.0001		<.0001		<.0001
Yes	689	9.47 (1.25)		4.43 (1.46)		3.74 (1.55)		4.47 (0.78)		2.34 (0.79)		0.73 (0.44)	
No	3296	9.11 (1.68)		4.15 (1.65)		3.20 (1.81)		4.28 (0.93)		2.20 (0.91)		0.64 (0.48)	
Income[2] (unit: 10,000won)			<.0001		<.0001		<.0001		<.0001		<.0001		<.0001
Low ≤115	915	8.78 (1.98)		3.75 (1.73)		2.74 (1.88)		4.07 (1.00)		1.97 (0.99)		0.51 (0.50)	
Low-middle 116-419	911	9.00 (1.69)		3.92 (1.66)		2.84 (1.87)		4.13 (1.00)		2.08 (0.92)		0.56 (0.50)	
High -middle 420-1,199	916	9.24 (1.45)		4.25 (1.53)		3.44 (1.70)		4.38 (0.84)		2.29 (0.82)		0.68 (0.47)	
High ≥1,200	918	9.72 (0.80)		4.84 (1.27)		4.18 (1.23)		4.68 (0.57)		2.57 (0.66)		0.88 (0.33)	

Note: All values are mean(SD)
1) 'Living without partner': separated, divorced, widowed, missing, and never married; 'Living with partner': currently married or living with a partner
2) Missing n=325

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Table 2 shows characteristics between different occupation classifications and K−MMSE scores. There are three kinds of occupation categories. Firstly, this study categorized all occupation into five sub groups. At language domain, there was significant difference between five sub groups. White collar group showed the highest score and skilled agriculture/forestry/fishery showed the lowest scores. Secondly, the results show average K−MMSE scores and occupational complexity with data, people, and things but there was no significant differences. Thirdly, job based on socioeconomic status and average K−MMSE scores were shown, and between the 'High' group and 'Low' group, there was no significant difference.

Table 2. Characteristics between occupation categories and K-MMSE components

Variables	N	Orientation(/10)	Memory(/6)	Attention(/5)	Language(/5)	Command(/3)	Spatiality(/1)
Occupation							
manager/professionals	870	9.14 (1.71)	4.24 (1.60)	3.30 (1.77)	4.36 (0.90)	2.21 (0.90)	0.69 (0.46)
Service/sales	662	9.19 (1.63)	4.21 (1.62)	3.29 (1.81)	4.32 (0.88)	2.21 (0.93)	0.64 (0.48)
Skilled agriculture/forestry,	1077	9.13 (1.65)	4.09 (1.67)	3.21 (1.81)	4.23 (0.96)	2.18 (0.90)	0.63 (0.48)
machinery/technicians	703	9.22 (1.56)	4.24 (1.62)	3.39 (1.76)	4.34 (0.89)	2.27 (0.86)	0.68 (0.47)
elementary workers	673	9.23 (1.49)	4.26 (1.56)	3.32 (1.77)	4.34 (0.90)	2.29 (0.86)	0.67 (0.47)
p		0.57	0.15	0.31	0.02	0.09	0.07
Job complexity with							
Data	870	9.14 (1.71)	4.24 (1.60)	3.29 (1.77)	4.36 (0.90)	2.21 (0.90)	0.69 (0.46)
People	662	9.19 (1.63)	4.21 (1.62)	3.29 (1.81)	4.32 (0.88)	2.21 (0.93)	0.64 (0.48)
Thing	2453	9.18 (1.59)	4.18 (1.63)	3.29 (1.79)	4.29 (0.92)	2.24 (0.88)	0.65 (0.48)
p		0.8	0.65	0.99	0.12	0.64	0.15
Job based SES							
High (White collar)	870	9.14 (1.71)	4.24 (1.60)	3.29 (1.77)	4.36 (0.90)	2.21 (0.90)	0.69 (0.46)
Low (Blue collar)	2453	9.18 (1.59)	4.18 (1.63)	3.29 (1.79)	4.29 (0.92)	2.24 (0.88)	0.65 (0.48)
p		0.8	0.65	0.99	0.12	0.64	0.15

Note: All values are mean(SD)

2. Effect of occupation categories on K-MMSE scores in six domains

Table 3 shows the association between occupation categories and K-MMSE scores in six domains. Female K-MMSE scores were significantly lower than male scores in four of the six domains (orientation, attention, language and spatiality domain) and as age increased K-MMSE scores were decreased significantly at all domains. When educated years was longer, K-MMSE scores were also high and people who depression had showed lower scores both at all domains. Moreover people in the higher income groups had better scores at most domains.

In the occupation categories, when adjusted for gender, age, marital status, education level, and depression, there was a noticeable result. Firstly, in the orientation domain, they did not show significant results. However, at memory domain, elementary workers (b=0.15, SE=0.07, p=0.03) and white collar (b=0.15, SE=0.06, p=0.02) showed significantly higher scores than skilled workers as reference. At language section elementary workers (b=0.10, SE=0.04, p=0.01), service/sales worker (b=0.10, SE=0.04, p=0.01) and white collar (b=0.14, SE=0.04, p=<.0001) showed higher cognitive ability. In

command category, only the elementary workers had high cognitive function (b=0.10, SE=0.04, p=0.01) and in spatiality section, white collar showed high score (b=0.06, SE=0.02, p=0.002).

Table 4 shows effects of job complexity of work with data, people, and thing. Male had better cognitive scores than female at orientation, attention, language and spatiality domain, and there was negative aging effects to K−MMSE score at all domains. Living alone showed worse cognitive function than people living with a partner at all domains, except for the command section, whilst the educated years showed positive association to K−MMSE scores at all domains. Also, depression affected the K−MMSE scores negatively at all domains and higher income group showed better scores. When adjusted for all these variables in orientation, memory, attention and command, complexity of work with data, people, and thing had no significant results. However, compared to complexity of work with people and thing, complexity of work with data showed high cognitive function at memory domain (b=0.11, SE=0.06, p=0.05) language domain (b=0.1, SE=0.03, p=0.001), and spatiality domain (b=0.04, SE=0.02, p=0.003).

Table 5 shows effects of job based on socio-economic status (SES).

Female showed significantly worse K-MMSE scores than males at orientation, attention, language, and spatiality sections and as age increased K-MMSE scores were decreased at all domains. Cohabiting people show better cognitive function scores than people who were living alone at all domains except command section and as educated years were longer, K-MMSE scores were also better at all domains. Also, people who did not have depression showed better K-MMSE scores than those who had depression at all domains and higher income group showed positive association with all cognitive function domains.

Job based on SES had no significant differences in orientation, memory, attention, and command however, at language and spatiality domains there were noticeable results when all other variables were adjusted for.

Compared with low socioeconomic job status, high socioeconomic job status showed improved cognitive function at language (b=0.09, SE=0.03, p=0.002) and spatiality domain (b=0.05, SE=0.02, p=0.002)

Overall K-MMSE score was associated with gender, age, education level, depression and income. Table 3 showed that manager/professionals(b=0.58, SE=0.23, p=0.01), machinery/technicians(b=0.44, SE=0.23, p=0.05) and elementary workers(b=0.603, SE=0.209, p=0.004) are significantly associated with total K-MMSE score, but complexity of work with data/people/thing (Table 4) and job based SES (Table 5) showed no significance with overall K-MMSE score.

Table 3. Association between occupation and K-MMSE scores in six domains

	Orientation			Memory			Attention			Language			Command			Spatiality			Total K-MMSE		
	b	SE	p value	b	SE	p	b	SE	p	b	SE	p	b	SE	p	b	SE	p	b	SE	p
Gender	-0.05 ***	0.01	0.0002	-0.01	0.01	0.52	-0.12 ***	0.01	<.0001	-0.04 ***	0.01	<.0001	-0.01	0.01	0.10	-0.02 ***	0.00	<.0001	-0.12 *	0.049	0.02
Age	-0.06 ***	0.003	<.0001	-0.06 ***	0.00	<.0001	-0.06 ***	0.00	<.0001	-0.03 ***	0.00	<.0001	-0.03 ***	0.00	<.0001	-0.02 ***	0.00	<.0001	-0.26 ***	0.01	<.0001
Marital status	-0.07 ***	0.02	0.0008	-0.07 ***	0.02	0.00	-0.10 ***	0.02	<.0001	-0.06 ***	0.01	<.0001	-0.02	0.01	0.07	-0.02 ***	0.01	0.0009	-0.41 ***	0.065	<.0001
Education level																					
≤6 yeas	REF			REF			REF			REF			REF			REF			REF		
7< years ≤12	0.23 ***	0.06	<.0001	0.54 ***	0.05	<.0001	0.65 ***	0.06	<.0001	0.29 ***	0.03	<.0001	0.19 ***	0.03	<.0001	0.20 ***	0.02	<.0001	2.04 ***	0.18	<.0001
≥ 13 years	0.37 ***	0.09	0.0002	0.91 ***	0.10	<.0001	1.02 ***	0.10	<.0001	0.38 ***	0.05	<.0001	0.42 ***	0.05	<.0001	0.30 ***	0.03	<.0001	3.30 ***	0.31	<.0001
Depression	-0.53 ***	0.09	<.0001	-0.29 ***	0.08	0.00	-0.38 ***	0.09	<.0001	-0.24 ***	0.05	<.0001	-0.24 ***	0.05	<.0001	-0.12 ***	0.02	<.0001	-1.70 ***	0.27	<.0001
Smoke	0.07	0.07	0.32	0.03	0.07	0.62	0.06	0.07	0.42	-0.03	0.04	0.49	0.00	0.04	0.93	-0.02	0.02	0.35	0.12	0.21	0.56
Income																					
Low	REF			REF			REF			REF			REF			REF			REF		
Low-middle	0.27 ***	0.06	<.0001	0.18 ***	0.06	0.00	0.08	0.07	0.23	0.08 *	0.03	0.03	0.12 ***	0.04	0.00	0.03	0.02	0.06	0.58 **	0.21	0.01
High-middle	0.29 ***	0.07	<.0001	0.30 ***	0.06	<.0001	0.40 ***	0.07	<.0001	0.19 ***	0.04	<.0001	0.23 ***	0.04	<.0001	0.09 ***	0.02	<.0001	1.509 ***	0.21	<.0001
High	0.24 **	0.07	0.001	0.32 ***	0.07	<.0001	0.42 ***	0.08	<.0001	0.14 ***	0.04	0.00	0.23 ***	0.04	<.0001	0.11 ***	0.02	<.0001	1.55 ***	0.23	<.0001
Occupation																					
Skilled workers	REF			REF			REF			REF			REF			REF			REF		
manager/professionals	0.04	0.07	0.5	0.15 *	0.06	0.02	0.10	0.07	0.15	0.14 ***	0.04	<.0001	0.03	0.04	0.36	0.06 **	0.02	0.0019	0.58 **	0.23	0.01
Service/sales workers	0.07	0.07	0.34	0.12	0.07	0.09	0.10	0.08	0.23	0.10 *	0.04	0.01	0.02	0.04	0.57	0.01	0.02	0.52	0.33	0.22	0.14
Machinery/technicians	0.04	0.07	0.56	0.07	0.07	0.32	0.09	0.07	0.25	0.06	0.04	0.11	0.05	0.04	0.24	0.02	0.02	0.32	0.44 **	0.23	0.05
Elementary workers	0.11	0.07	0.14	0.15 *	0.07	0.03	0.10	0.08	0.22	0.10 *	0.04	0.01	0.10 *	0.04	0.01	0.03	0.02	0.11	0.603 **	0.209	0.004

Notes : Skilled workers=Skilled agriculture/forestry/fishery workers; b=regression coefficient; SE=standard error

* ≤.05

** <.01

*** <.001

Table 4. Association between job complexity of work and K-MMSE scores in six domains

	Orientation			Memory			Attention			Language			Command			Spatiality			Total K-MMSE		
	b	SE	p	b	SE	p	b	SE	p	b	SE	p	b	SE	p	b	SE	p	b	SE	p
Gender	-0.05 **	0.01	0	-0.01	0.01	0.53	-0.12 ***	0.01	<.0001	-0.04 ***	0.01	<.0001	-0.01	0.01	0.11	-0.02 ***	0.003	<.0001	-0.12 *	0.049	0.0171
Age	-0.07 ***	0.003	<.0001	-0.06 ***	0.003	<.0001	-0.06 ***	0.003	<.0001	-0.03 ***	0.001	<.0001	-0.03 ***	0.002	<.0001	-0.02 ***	0	<.0001	-0.26 ***	0.01	<.0001
Marital status	-0.07 ***	0.02	0.0011	-0.07 ***	0.02	0	-0.1 ***	0.02	<.0001	-0.06 ***	0.01	<.0001	-0.02	0.01	0.07	-0.02 ***	0.01	0.0011	-0.41 ***	0.065	<.0001
Education level																					
≤6 yeas	REF			REF			REF			REF			REF			REF			REF		
7< years ≤12	0.23 ***	0.06	<.0001	0.55 ***	0.05	<.0001	0.66 ***	0.06	<.0001	0.29 ***	0.03	<.0001	0.2 ***	0.03	<.0001	0.2 ***	0.02	<.0001	2.061 ***	0.177	<.0001
≥ 13years	0.37 ***	0.1	0.0002	0.91 ***	0.1	<.0001	1.02 ***	0.1	<.0001	0.39 ***	0.05	<.0001	0.43 ***	0.05	<.0001	0.3 ***	0.03	<.0001	3.319 ***	0.314	<.0001
Depression	-0.53 ***	0.09	<.0001	-0.28 ***	0.08	0.0007	-0.37 ***	0.09	<.0001	-0.24 ***	0.05	<.0001	-0.24 ***	0.05	<.0001	-0.11 ***	0.02	<.0001	-1.68 ***	0.27	<.0001
Smoke	0.07	0.07	0.32	0.03	0.07	0.62	0.06	0.07	0.42	-0.03	0.04	0.5	0	0.04	0.93	-0.02	0.02	0.36	0.126	0.212	0.5519
Income																					
Low	REF			REF			REF			REF			REF			REF			REF		
Low-middle	0.27 ***	0.06	<.0001	0.18 **	0.06	0.005	0.08	0.07	0.24	0.08 *	0.03	0.03	0.12 **	0.04	0.001	0.03	0.02	0.06	0.579 **	0.208	0.0053
High-middle	0.29 ***	0.06	<.0001	0.3 ***	0.06	<.0001	0.4 ***	0.07	<.0001	0.19 ***	0.04	<.0001	0.23 ***	0.04	<.0001	0.09 ***	0.02	<.0001	1.515 ***	0.21	<.0001
High	0.24 ***	0.07	0.0012	0.31 ***	0.07	<.0001	0.42 ***	0.08	0.0007	0.13 ***	0.04	0.0007	0.23 ***	0.04	<.0001	0.1 ***	0.02	<.0001	1.532 ***	0.233	<.0001
Job complexity of work with																					
Thing	REF			REF			REF			REF			REF			REF			REF		
Data	0.004	0.06	0.74	0.11 *	0.06	0.05	0.05	0.06	0.22	0.1 ***	0.03	0.001	-0.01	0.03	0.8081	0.04 ***	0.02	0.003	0.349	0.181	0.0542
People	0.03	0.06	0.6	0.06	0.06	0.3352	0.04	0.07	0.43	0.05	0.03	0.1	-0.02	0.04	0.61	-0	0.02	0.93	0.19	0.201	0.3449

* ≤.05

** <.01

*** <.001

Table 5. Association between job based SES and K-MMSE scores in six domains

	Orientation			Memory			Attention			Language			Command			Spatiality			Total K-MMSE		
	b	SE	p	b	SE	p	b	SE	p	b	SE	p	b	SE	p	b	SE	p	b	SE	p
Gender	-0.05 ***	0.01	0.0003	-0.01	0.01	0.53	-0.12 ***	0.01	<.0001	-0.04 ***	0.01	<.0001	-0.01	0.01	0.11	-0.02 ***	0	<.0001	-0.12 *	0.049	0.0167
Age	-0.07 ***	0.003	<.0001	-0.06 ***	0.003	<.0001	-0.06 ***	0	<.0001	-0.03 ***	0	<.0001	-0.03 ***	0	<.0001	-0.02 ***	0	<.0001	-0.26 ***	0.01	<.0001
Marital status	-0.07 ***	0.02	0.001	-0.07 ***	0.02	0.0003	-0.1 ***	0.02	<.0001	-0.06 ***	0.01	<.0001	-0.02	0.01	0.07	-0.02 ***	0.01	0.0011	-0.4 ***	0.065	<.0001
Education level																					
≤6 yeas	REF			REF			REF			REF			REF			REF			REF		
7< years ≤12	0.23 ***	0.06	<.0002	0.55 ***	0.05	<.0001	0.66 ***	0.06	<.0001	0.29 ***	0.03	<.0001	0.19 ***	0.03	<.0001	0.2 ***	0.02	<.0001	2.061 ***	0.177	<.0001
≥ 13 years	0.37 ***	0.1	0.0002	0.91 ***	0.1	<.0001	1.02 ***	0.1	<.0001	0.39 ***	0.05	<.0001	0.43 ***	0.05	<.0001	0.3 ***	0.03	<.0001	3.321 ***	0.314	<.0001
Depression	-0.53 ***	0.09	<.0001	-0.28 ***	0.08	0.0008	-0.38 ***	0.09	<.0001	-0.2 ***	0.05	<.0001	-0.24 ***	0.05	<.0001	-0.11 ***	0.02	<.0001	-1.69 ***	0.27	<.0001
Smoke	0.07	0.07	0.32	0.03	0.07	0.63	0.06	0.07	0.42	-0.03	0.04	0.48	0	0.04	0.92	-0.02	0.02	0.36	0.122	0.212	0.5647
Income																					
Low	REF			REF			REF			REF			REF			REF			REF		
Low-middle	0.27 ***	0.06	<.0001	0.18 **	0.06	0.005	0.08	0.07	0.24	0.08 *	0.03	0.03	0.12 ***	0.04	0.001	0.03	0.02	0.06	0.577 **	0.208	0.0055
High-middle	0.29 ***	0.07	<.0001	0.3 ***	0.06	<.0001	0.4 ***	0.07	<.0001	0.19 ***	0.04	<.0001	0.23 ***	0.04	<.0001	0.09 ***	0.02	<.0001	1.512 ***	0.21	<.0001
High	0.24 **	0.07	0.001	0.31 ***	0.07	<.0001	0.42 ***	0.08	<.0001	0.13 ***	0.04	0.0008	0.23 ***	0.04	<.0001	0.11 ***	0.02	<.0001	1.529 ***	0.233	<.0001
Job based SES																					
Low	REF			REF			REF			REF			REF			REF			REF		
High	-0	0.06	0.97	0.1	0.05	0.07	0.06	0.06	0.29	0.09 ***	0.03	0.002	0.01	0.03	0.79	0.05 ***	0.02	0.002	0.308	0.176	0.0798

* ≤.05
** <.01
*** <.001

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Chapter Ⅳ.   Discussion and conclusion

This study examined the association between primary occupation categories and K-MMSE sub-domain scores using data from the Korean Longitudinal Study of Aging (KLoSA).

 The population of this study, a total 3,985 subjects from KLoSA who were residents, 55 years old and above, in Republic of Korea excluding Jeju Island was used to identify the cognitive function which was developed from primary occupation.

 This study measured primary occupation in three ways. First, primary occupation was classified into five job categories as manager/professionals, service/sales worker, skilled agriculture/forestry and fishery workers, machinery/technicians, and elementary workers. In the second method, primary occupation was divided into complexity of work with data, people, and things. This division was based on the concept that complexity of job environment may affect the cognitive function (Bosma, van Boxtel et al. 2003). Lastly, this study categorized primary occupation as job based socioeconomic status. High level group was white collar including manager, professionals/associate professionals and clerks. Low level was

blue collar including_machinery/technicians, elementary works and skilled agriculture/forestry and fishery workers according to the previous study (Karp, Kareholt et al. 2004). Also this study considered gender, age, educational level, marital status, depression, smoke and income as confounders that affect K-MMSE scores.

The results of this study show significant association between primary occupation categories and K-MMSE scores. Manager/professionals showed better cognitive function at memory, attention, language and spatiality domain. Previous studies have found that visual ability function falls in elderly population (Ramirez, Wood et al. 2010) however, in the manager/professionals in this study who worked with high mental ability demanding jobs showed higher cognitive performance spatiality domain. Also another study mentioned delayed recall was strongly related with cognitive decline in elderly people (Guerrero-Berroa, Luo et al. 2009) but professionals in this study showed high scores at memory domain compared with other occupation categories, suggesting the role of occupation in retaining the level of cognitive function in the elderly. Service/sales workers showed greater K-MMSE

scores at attention and language domains which are necessary skills when dealing with people. Machinery/technician workers showed no significant result in this study but elementary workers show better K-MMSE scores at memory, attention, language and command.

When categorized primary occupation into the complexity of work with data, people, thing, it showed some considerably significant results. Previous studies have shown that the complexity with data and people were associated with cognitive function (Finkel, Andel et al. 2009). Also another study found that only complexity of work with data was strongly associated with K-MMSE scores (Andel, Kareholt et al. 2007). This study showed similar result to the past findings. The workers who handle complex work with data showed greater K-MMSE scores at language and spatiality domains. This is similar to the results of professional workers cognitive ability. Occupational based socio-economic status also showed obvious result with K-MMSE scores. White collar shows better K-MMSE scores at language and spatiality domains compared with blue collar.

The results from this study supports evidence from previous

studies in which the quality and level of education affects the cognitive function (A, DA et al. 2007). People who attained a higher level of education demonstrated preserved cognitive function in this study. Similarly, this study also found that the groups with more income were more likely to be related with better cognitive scores. This shows similar results found by other studies that show a significant association between increase in income and an increase in cognitive performance(Lee, Buring et al. 2006).

The principal conclusion from this study is that there is evident association between primary occupation and cognitive ability that can be drawn from K-MMSE screening test. Cognitive function can be formed by working at the primary occupation for a long time.

People who deal with the complexity of work with data and people in occupation-based high socio-economic group showed greater cognitive ability. Moreover, this study showed various occupations are associated with different cognitive abilities for accomplishing their purposes at job environment.

This results may prove the concept of "use it or loss it"

(Katzman 1995). If people use their cognitive ability while they perform their jobs, they develop specific cognitive function that is required for that job and maintain that function in elders.

The purpose of this study was to suggest guidelines to provide adequate jobs for retired elderly people. As the results suggest that different cognitive abilities which had been formed during their primary occupation remained even after they retired, it may help to consider the primary lifetime occupation of elderly people in allocating them into positions in the workforce.

Chapter Ⅴ. Limitation

Several limitations need to be considered. First, this study was a cross-sectional study. Longitudinal study would offer precise change of cognitive ability according to the primary lifetime occupation, however with this study design, the direction of relationship is difficult to determine. Second, this study explored primary occupation defined as people's longest-serving job. However this method would not have precisely reflected people's primary occupation if they changed their jobs often. Third, although this study considered several confounders that are thought to have an influence on the cognitive ability such as education levels, smoke, marital status, income, and depression, it is likely that there are other potential factors that were not accounted for in this study, which could have affected the results. Fourth, most workers retire after the age of 60, our study population may have included subject who were currently employed at the time of the survey, as this study used a cut-off age of 55 to examine whether the cognitive ability was preserved in the elderly population. However, as our study objective was to find evidence to provide guidelines when considering employment positions for

retired elders, this limitation may be addressed by the fact that people over the age of 55 are looking to be re-enter the workforce (Park, 2006). Fifth, 'cognitive function' in this study was estimated by K-MMSE score. K-MMSE is a well established tool to measure cognitive function in elderly people, but it might have some limitation to consider that this instrument reflects the actual cognitive function. Lastly, because it is difficult to evaluate individual's intellectual endeavor in the same job, there is a chance the exact effects of job complexity was underestimated. Also, subjective complexity of job measures may show different results compared to objective measures (Finkel et al, 2009)

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국문초록

고령 인구에서 주요 직업과 인지기능의 연관성

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이효림

연구목적

　사람들은 대부분의 삶의 많은 시간을 직장에서 일을 하며 보낸다. 어떤 종류의 직장에서 어떤 업무를 수행하는 가는 그 사람들의 특정 인지 기능을 필요로 하며 직업의 종류마다 전문적으로 취급하는 일이 다르기 때문에 그 일을 수행하기 위해 필요한 인지적 기능이 모두 다를 것이다. 삶에서 가장 많은 시간을 보낸 직장 업무는 사람들의 특정 인지기능을 계속 사용하게 함으로써 그 분야를 향상시켰을 것이고 그렇지 않은 사람들보다 더 나은 수행능력을 보일 것이다. 노령인구에서 평생에 걸친 주요 직업의 수행이 노령 기에 어떤 인지 능력을 발달시켜왔고 또한 어떤 인지 기능이 보존 되어 있는지 보는 것이 이 논문의 목적이다.

연구방법

ⅰ) 연구대상

　Korean Longitudinal Study of Aging (KLoSA)는 제주도를 제외한 지역에 거주하는 45세 이상 중·고령자로 표본 수 약 10.000명이 조사되었는데 이 중 55세 이상의 남, 녀를 대상으로 한다.

ⅱ) 자료수집

주요직업

　설문지 데이터를 통해 개인당 평생에 걸쳐 가장 오랜 시간 일한 직업을 조사한다. 직업은 그 종류와 성격에 따라 i) manager/professionals, ii) service/sales workers, iii) machinery/technicians, iv) elementary workers, 그리고 v) skilled agriculture/forestry/fishery workers 로 나누었다.

인지능력 점수

Korean version of the Mini-Mental State Examination (K-MMSE) 로 측정한 점수를 사용하였다. 인지기능은 K-MMSE 항목의 성격에 따라 orientation, memory, attention, language, command, spatiality로 구분 하여 평가하였다.

iii) 통계분석
기술통계는 인지기능의 orientation, memory, attention, language, command, spatiality 6가지 영역에 성별, 나이, 결혼상태, 교육수준, 우울여부, 흡연, 개인 총소득과 주요직업을 변수로 하여 기술통계를 내어 평균과 표준편차를 나타내었다. 인지기능의 orientation, memory, attention, language, command, spatiality 6가지 영역의 점수와 주요직업과의 연관성을 보기 위해 multiple regression을 분석하였고 모든 통계분석은 유의수준 0.05로 하며 SAS 9.2 를 사용 하였다.

연구결과
Manager/professionals 그룹에서 memory, language, spatiality 영역에서 유의미하게 높은 점수를 보였고 service/sales worker 는 language 영역에서 높은 점수를 보였다. elementary workers 는 command 영역에서 유의미한 점수를 보였다. Job complexity 간의 차이를 보았을 때는 data를 다루는 집단에서 memory 와 language, spatiality 에서 높은 점수를 보여주었다. 또한 Job based SES를 보았을 때에는 white collar 그룹이 language, spatiality 영역에서 유의미하게 높은 점수를 나타내었다.

결론
평생에 걸친 주요 직업이 노년기의 인지기능에 영향을 미침을 알 수 있다. 주로 정신적 노동을 하거나 문서를 다루는 직업에서 기억과 언어, 공간능력이 발달한 것으로 보이고 사람과의 관계에서 많은 일을 한 그룹은 언어기능이 잘 유지되어 있음을 알 수 있다. 또한 육체노동의 일에 종사한 그룹에서는 명령시행을 수행하는 능력이 보존되어 있음을 보이고 있다. 따라서 평생에 걸친 주요직업을 알아보는 것은 노년기에 어떤 인지기능이 발달, 보존 되어있는지를 알 수 있는 하나의 척도가 될 것으로 기대된다.

감사의 글

2년 간의 대학원 생활을 다행히 마무리 지을 수 있게 되었습니다. 첫 학기 때 교수님께서 여러 분야에서의 경험들이 후에 제게 큰 자산이 될 것이라고 말씀해 주셨습니다. 그 말씀이 제게 큰 힘이 되었습니다. 지난 2년간 지도해주신 조성일 교수님께 감사 드립니다. 부족한 논문을 지도해 주신 성주헌 교수님과 김홍수 교수님께도 진심으로 감사 드립니다.

2년 동안 대학원 공부뿐 아니라 삶 속속들이 따뜻한 애정과 관심으로 큰 도움을 주신 김태훈 선생님, 김인경 선생님과 프로젝트를 하는 동안 많이 가르쳐 주시고 늘 격려해 주신 윤규현 선생님께 감사의 말씀을 전하고 싶습니다. 또한 늘 할 수 있다는 용기와 대학원 생활 동안 많은 도움을 준 박지원 선생님께 감사 드립니다. 수백 번 같은 고민에도 늘 귀담아 들어주는 자유로운 방랑자 정조교와 무심한 듯 그러나 항상 애정을 듬뿍 담아 힘을 주는 최석사에게도 고마움을 전합니다.

마지막으로 부모님께 감사 드립니다. 사랑합니다.

<div style="text-align: right;">

2012년

이효림 올림

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