Effects of a brief intervention for cognitive health among community elderly: A cluster randomized controlled trial

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ABSTRACT

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Background: There is now widespread public interest in developing strategies to maintain or enhance cognitive health in the elderly. Cognitive decline in the elderly involves multiple pathophysiologic and psychosocial processes. Thus, research that focuses on preserving cognition may well identify a different set or combination of risk factors and thus different prevention strategies for healthy elderly subjects.

Methods: This study examines 12-month outcomes from a clustering randomized controlled trial of a 5 group intervention vs a control condition among elderly aged over 60 years old. Hypotheses were that the interventions would be more effective than the control in reducing cognitive decline at 12 months' follow-up.

Results: This report describes a cluster randomized controlled trial of a brief intervention in a group of community dwelling elderly. This is the first study to examine the effectiveness of an intervention for cognitive health in a community setting. We found that the trial resulted in a change of mental and social activity in the score for the intervention group compared with the control group. However, the intervention did not

result in a clinically meaningful improvement in MMSE scores.

Conclusion: Considering that lifestyle behaviors co-occur, multiple health behavior approach appears more practical. In the brief intervention, encouragement of mental and social activity would be helpful in cognitive health of the community dwelling elderly.

Key words : cognition, lifestyle behavior, elderly, intervention, MMSE

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I. INTRODUCTION

Prevention for cognitive decline and delay in the onset of dementia would lead to its reduced prevalence and long-term care costs.[1,2] Considering cognitive impairment and dementia as a continuum, it would be important to identify modifiable risk factors influencing change in cognitive function over time.[3] Recently, there has been a growing emphasis on the identification of risk factors and development of prevention strategies for cognitive health.[4,5] Previous studies have demonstrated that health behaviors, such as smoking, physical activity, alcohol drinking, diet, and weight significantly influence cognitive function and dementia in late life. Recent study suggested a potential benefit of engagement in multiple healthy lifestyles for maintaining cognitive health. A systematic review of epidemiologic studies found that physical, mental, and social leisure activities were inversely associated with dementia and Alzheimer disease risk.[6] Leisure activities incorporating physical, social, and mental components have been found to lower dementia risk.[7] A greatest benefit was found among those involved in two or more components of activities. To prevent cognitive decline, optimal combined pharmacological, behavioral, and

nutritional interventions would be recommended.[8]

Whether interventions will prevent or delay cognitive decline and dementia is unclear. Prior interventions with older adults have targeted those with cognitive deficits and have focused on remediation rather than prevention.[9,10] Prior studies have shown that cognitive interventions can improve cognitive abilities in normal elders but have been limited by small, homogeneous samples and lack of randomization.[11,12] Despite some encouraging associations found in observational studies, randomized controlled trials of specific interventions have not definitively established positive therapeutic effects on maintaining or improving cognitive function or preventing cognitive decline.

Most cognitive intervention programs for patients with mild cognitive deficits are provided under hospital settings rather than under community settings. Limitations in time and resources and the perceived ineffectiveness of counseling prevent physicians from counseling patients about health behavior. Health behaviors are notoriously difficult to change as seen in decades of public health initiatives to promote a healthy diet and physical activity have failed to reverse the obesity epidemic. The context for behavior change is unlike that of clinical interventions, for which medicine's elaborate infrastructure can largely control delivery and outcomes. Behavior change occurs where people live—at home, work, and school—but the community offers little infrastructure for modifying lifestyle.[13]

Clustering of multiple risk factors increasing dementia risks further imply synergistic effects of health behaviors.[14] A increment in global cognitive function scores have been demonstrated with each additional lifestyle factors in a recent study. Overall findings indicate the potential advantage of adopting multiple healthy lifestyles.[15] Most of studies, however, have focused on examining individual effects. Because health behaviors tend to cluster,[16] it is important to examine the combined effects of multiple behavioral factors.

Midlife health behaviors were found to contribute to cognitive health in

later years, suggesting cumulative effects of healthy lifestyles. A general model of dementia occurrence should takes into account the effect of different risk and protective factors acting at different times during the life course of an individual. Dementia and Cognitive functions are so complex that they are determined by many variables, and associations often involve correlated factors. For example, individuals with higher levels of education are also more likely to have greater cognitive engagement, making it difficult to determine whether either factor has a causal role. We have no data to help disentangle whether the social, mental, and physical stimulation in late life can decrease the lifetime risk of disease or merely postpone the onset of dementia.

Improving the quality of mental health care requires continued efforts to move evidence-based treatments of proven efficacy into real-world practice settings with wide variability in patient characteristics and clinician skill. The purpose of the current study was to conduct a cluster randomized controlled trial to test the effectiveness of public recommendations for older adults. This study examines 12-month outcomes from a clustering randomized controlled trial of a 5 group intervention program for preventing cognitive decline, the Gold medal Program vs a control condition among elderly aged over 60 years old. Hypotheses were that the interventions would be more effective than the control in reducing cognitive decline at 12 months' follow-up.

II. MATERIALS AND METHODS

1. Study design and setting

We updated on the evidence on major health behaviors affecting cognitive function in older people living in the community. A systematic review was conducted, involving a comprehensive search of the literature and critical appraisal of studies. Public recommendations were developed based on a systematic review of the literature. Significant lifestyle variables found to predict cognitive function and dementia in later life were physical activity, non-smoking, social activity, cognitive activity, moderate alcohol consumption, normal body weight, and nutrition. Cognitive health recommendations were developed and named PASCAL, an acronym for (1) Physical activity, (2) Anti-smoking, (3) Social activity, (4) Cognitive activity, (5) Alcohol drinking in moderation, and (6) Lean body mass and healthy diet. These recommendations can be used to educate the public and raise awareness in health professionals to the important role a healthy lifestyle plays in maintaining cognitive health in later life.[17]

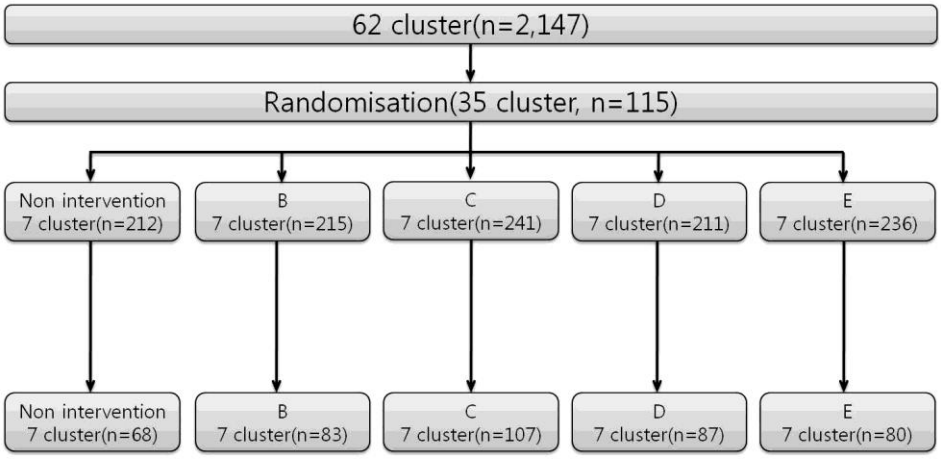
We developed an intervention based on principles of cognitive behavior therapy, which could be delivered by ordinary primary health workers. We used a manual including step by step instructions for each session to train the health workers. The intervention, called the Gold Medal Program, used cognitive behavior therapy techniques of lifestyle modification. Further details of the intervention process are described elsewhere. This was a cluster randomized controlled trial designed to determine the impact of intervention on cognitive health in elderly at a community level. The rationale for a cluster approach was based on our objective to assess the effectiveness of health systems intervention at a population level. The study was started in 2008 and ended in 2010.

2. Study area and participants

The trial was conducted from February 2008 to June 2010 at a geriatric mental health community center in Suwon, south Korea. The location of the survey was Suwon City, with a population of 1 million, located adjacent to Seoul, the nation's capital. The center, which has been established since 2008 and has outreach sites throughout the districts, provides a range of social, health, educational, and recreational services for users of elderly groups. The study was approved by the institutional review board of Ajou University.

Community-dwelling Korean elderly were eligible if they resided in one of the districts covered by the community center, and were 60 years or older. Care management was delivered by a nurse care manager trained in assessing health behavior; in providing dementia specific education; and in making treatment adjustments according to evidence based guidelines. Criteria for exclusion included severe visual or hearing impairment and a previous diagnosis of idiopathic Parkinson's disease, liver disease, alcoholism, or known terminal illness. Prior to initiating the study, we obtained a list of all senior citizen centers. A random number table was used to classify the intervention group.

Figure 1 Flow chart



3. Intervention and control groups

Six community health workers, who usually have 12-16 years of schooling, were trained in methods of conveying standardized health education messages, using behavior change communication strategies. The training took place according to a case based curriculum on nutrition and healthy lifestyles developed by psychiatrists. Health messages included information on the deleterious effects of dementia and nondrug interventions for preventing and controlling dementia. Advice was given on nutrition and the importance of engaging in moderate physical. mental, social activity, restriction of alcohol drinking and tobacco cessation. Items checked on a health behavior Checklist activated a specific behavioral intervention protocol that had been developed for this study.

Usual care participants received no additional services. Participants in the group B received bimonthly telephonic care management based on manual. Manager received training on a brief advice process, consisting of assessing activity level using a simple self-assessment tool; providing advice to increase activity and select a long-term goal. Participants in the group C received monthly the same telephonic care management and educational materials as those in the group B. Participants in the group D received health educator–initiated visit counseling bimonthly. The primary outcome was change in mini mental state examination (MMSE) scores from baseline to the final follow-up visit at one year.

To enhance adherence to the program, participants also received a modified behavioral intervention package based on social cognitive theory. The package was delivered via a workshop, a manual, newsletters, and telephone calls. The manual and the newsletters contained information on Gold Medal programs, rewards, goal setting, time management, and barriers to activity. During the intervention, participants underwent a structured interview by telephone to monitor progress of the Gold Medal program and to encourage continuing

compliance.

4. Assessments and measurements

The study protocol included cognitive screening through the MMSE, which has been validated for the Korean-speaking population[18], recording of the subject's medical history, and a detailed lifestyle factors. Nutritional risk was measured using the nutrition screening initiative (NSI) checklist. The NSI comprises 10 questions designed for ''yes'' or ''no'' answers. Based on the evaluation standard for the nutritional risk level, we assigned 0–2 points to a good nutritional state; 3–5 points, moderate nutritional risk state; and more than 6 points, high nutritional risk state. The NSI checklist is influenced by the type of family members living together, diseases, financial condition, age, and physical health condition, as well as its effects on cognitive function.[19]

In the interview, the subjects were asked to check one of three responses (''not concerned'', ''have little concern'' and ''have much concern'') to a question about their own health. Subjects who answered ''not concerned'' or ''have little concern'' were placed in the ''little or no health concern'' group, while those who answered ''have much concern'' were placed in the ''much health concern'' group. To assess physical, mental, and social activity of the subjects, we asked questions about each activity. The subjects were to answer either ''yes'' or ''no'' for the first part of the assessment; a ''yes'' was to be given if subjects were involved in one or more activities in each category; a ''no'' was to be given if the subject was not involved in any of the activities. For assessment of physical activity, the subjects were asked if they were currently engaged in regular physical exercise such as slow to brisk walking, stretching, farming, household work, looking after grand- children, running, hiking, aerobics, and cycling. If the subjects answered ''yes,'' they were asked the type of physical activity they enjoyed and the amount of time they spent engaged in

that activity per week. Mental activity was assessed by asking the subjects if they were engaged in any form of mental activity such as reading the newspaper or a book, listening to the radio, drawing, calligraphy, Korean poker, chess, taking courses, writing, learning a foreign language, or learning to operate a computer. If their answer was ‘‘yes,’’ they were asked to specify the length of time they engaged in the activity per week. Social activity was assessed by asking the subjects if they were involved in any organizations or clubs, religious organizations, social gatherings, senior houses, culture classes, volunteering, or working for the alumni or if they had a permanent job. If the subject answered ‘‘yes,’’ they were asked the length of time they typically spent per visit and the number of attendance per week.[20]

5. Statistical analysis

Statistical analysis was conducted using Statistical Analysis System version 9.2 (SAS Institute Inc, Cary, North Carolina); all significance tests were 2-sided and used a 5% level of significance. The intervention effects on cognitive function were examined by a generalized equation model. Regression models were constructed using the generalized estimating equations, to take into account the autocorrelation of the responses to produce consistent estimates

III. RESULTS

1. General characteristics of the subjects

The demographic characteristics of the participants according to study group are shown in TABLE 1. At baseline, the intervention and control groups were comparable on all.

Table 1 Characteristics of participants by intervention group (N(%), Mean ± SD)

Characteristics	A		B		C		D		E	
Demographics										
Age	77.5 ± 5.7		76.2 ± 6.8		77.4 ± 5.7		77.2 ± 6.5		76.5 ± 6.2	
Sex										
Men	21	(28.0)	17	(21.5)	22	(22.5)	18	(19.4)	16	(20.0)
Women	54	(72.0)	62	(78.5)	76	(77.6)	75	(80.7)	64	(80.0)
Education[a]										
Illiterate	15	(20.0)	36	(46.8)	41	(42.7)	33	(35.5)	28	(35.0)
Elementary	43	(57.3)	28	(36.4)	29	(30.2)	46	(49.5)	28	(35.0)
≥ Middle school	17	(22.7)	13	(16.9)	26	(27.1)	14	(15.1)	24	(30.0)
Mental health										
KDSQ	4.3 ± 4.0		4.7 ± 4.4		4.9 ± 3.9		4.8 ± 3.1		4.9 ± 3.8	
MMSE	24.0 ± 4.6		23.9 ± 5.0		22.9 ± 5.2		23.9 ± 5.0		23.4 ± 5.4	
BAI	6.1 ± 5.9		5.6 ± 6.0		5.0 ± 6.0		4.8 ± 4.5		5.5 ± 5.1	
PSQI	6.6 ± 3.2		6.6 ± 3.7		6.8 ± 3.3		6.8 ± 3.6		6.2 ± 4.1	

GDS	3.6 ± 3.7		3.6 ± 3.9		4.0 ± 3.6		3.4 ± 3.9		3.7 ± 3.5	
Health behavior										
Smoking										
Current	5	(6.9)	5	(6.9)	10	(10.9)	5	(6.0)	6	(8.7)
Nonsmoker	65	(89.0)	61	(83.6)	73	(79.4)	76	(91.6)	60	(87.0)
Past	3	(4.1)	7	(9.6)	9	(9.8)	2	(2.4)	3	(4.4)
AUDIT	1.8 ± 4.5		2.3 ± 4.8		2.2 ± 4.7		1.7 ± 4.2		1.3 ± 3.3	
Mini Dietary Assessment	38.5 ± 4.7		38.0 ± 4.8		38.9 ± 4.9		38.3 ± 5.6		39.6 ± 4.8	
Physical Activity[a]	32.0 ± 24.8		22.1 ± 18.4		22.8 ± 17.6		26.5 ± 23.6		29.6 ± 27.3	
Mental Activity	32.8 ± 25.4		29.9 ±17.0		30.4 ± 18.2		31.1 ± 26.3		29.8 ± 14.0	
Social Activity	28.6 ± 18.2		29.0 ± 16.2		28.9 ± 16.4		31.2 ± 19.1		28.1 ± 12.5	
Systolic Blood Pressure	142.7 ± 20.9		144.6 ± 21.5		141.3 ± 20.6		140.1 ± 19.6		137.4 ± 18.5	
Diastolic Blood Pressure	82.7 ± 13.0		83.6 ± 12.8		81.5 ± 12.7		82.1 ± 13.3		78.7 ± 11.2	
Blood Sugar	140.5 ± 50.5		143.7 ± 51.2		137.9 ± 58.8		141.5 ± 46.7		143.7 ± 48.6	
Cholesterol	157.2 ± 35.6		161.1 ± 32.5		165.7 ± 34.8		168.9 ± 41.9		173.6 ± 44.4	

2. Change of cognitive function according to study group

At baseline, the intervention and control groups were comparable on all. TABLE 2 shows the study outcomes at baseline and after intervention. At baseline, there were no significant differences between the groups on all outcomes. MMSE scores in the control group were reduced from baseline on average by 0.69 (95% confidence interval [CI], -1.47 to 0.08), while MMSE in the intervention group were reduced by 0.87 (95% CI, -1.95 to 0.21) at group B and 0.54 (95% CI, -1.23 to 0.14) at group C and 0.83 (95% CI, -1.56 to -0.12) at group D. After adjusting the baseline values, the intervention effects on the MMSE did not significantly differ.

Table 2 Clinical outcomes

Model	Baseline		Follow-up		Adjusted mean difference(95% CI)		P
	M	(SD)	M	(SD)	M	(95% CI)	
Unadjusted							
Group A	24.0	(4.6)	23.3	(4.6)	-0.69	(-1.47, 0.08)	0.080
Group B	23.9	(5.0)	23.0	(4.9)	-0.87	(-1.95, 0.21)	0.111
Group C*	22.9	(5.2)	22.3	(5.1)	-0.54	(-1.23, 0.14)	0.121
Group D	23.9	(5.1)	23.0	(5.3)	-0.83	(-1.56, -0.12)	0.023
Group E	23.4	(5.4)	23.6	(5.3)	0.20	(-0.61, 1.00)	0.623
Adjusted							
Group A	24.0	(2.9)	23.4	(2.8)	-0.56	(-0.75, -0.36)	<.0001
Group B	23.9	(3.7)	23.1	(3.6)	-0.65	(-0.86, -0.43)	<.0001
Group C	22.9	(3.5)	22.4	(3.6)	-0.47	(-0.66, -0.29)	<.0001
Group D	24.0	(3.4)	23.3	(3.6)	-0.66	(-0084, -0.48)	<.0001
Group E	23.7	(3.2)	23.3	(3.3)	-0.47	(-0.64, -0.30)	<.0001

Adjusted for age, sex, education, depressive symptom, anxiety

3. Association of health behaviors with cognitive function.

Lifestyle behaviors, when examined individually, were found to be significantly associated with cognitive function in the regression analysis (Table 3). In the unadjusted model, engaging in mental activity, social activity, vegetable consumption, and moderate drinking were found to be associated with an increase in the MMSE score. In the adjusted multivariate linear model, only engaging in mental activity and social activity was found to be significantly associated with positive cognitive functioning.

Table 3 Association of health behaviors with Rate of Change in Cognitive Function.

Variables	Unadjusted	Adjusted
	b (SE)	b (SE)
Smoking	-0.24 (0.66)	0.57 (0.54)
Drinking	0.17 (0.04)***	0.02 (0.04)
Mental Activity	0.04 (0.01)***	0.03 (0.01)***
Social Activity	-0.05 (0.01)***	-0.02 (0.01)**
Physical Activity	0.00 (0.01)	0.01 (0.01)
Nutrition Activity	0.16 (0.03)***	0.05 (0.03)

Adjusted for age, sex, education, depressive symptom, anxiety

Reference group: Smoking(NO)

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

IV. DISCUSSION

This report describes a cluster randomized controlled trial of a brief intervention in a group of community dwelling elderly. We found that the trial resulted in a change of mental and social activity for the intervention group compared with the control group. However, in spite of both health workers and older adults reported the program to be relevant and useful, the intervention did not result in a clinically meaningful improvement in cognitive function which is measured as MMSE scores. Across all outcomes, evidence for the effects of Gold Medal program was modest and was not observed until the 2-year follow-up. There are 2 possible explanations for these delayed outcomes. First, it is possible that a temporal lag between onset of health behavior and subsequent impact on cognitive function exists. Second, delayed intervention effects on function may be attributable to the samples that were excluded older adults with suspected cognitive decline from enrollment.

Only engaging in mental activity and social activity was found to be significantly associated with positive cognitive functioning. During recent years, numerous studies have examined the association of physical activity, mental activity, and social activity with cognitive function.[7] Regular physical activity has been shown to be an important protective factor in regard to cognitive decline in elderly persons.[21] Recent meta-analysis found that physical activity produced a positive effect on cognition, particularly on executive functions.[22] Epidemiological studies suggest that mid-and late-life exposure to enriched or complex environments that require mental activity has beneficial effects on cognition and on the risk for dementia.[23,24] Moreover, frequent participation in mental activity, such as cognitively stimulating activities for the elderly, has been found to be associated with a reduced risk of Alzheimer's disease.[25] Mental activity involves thinking and attention control processes, which might increase or maintain brain reserve even in old age.[26,27] Psychosocial aspects may

be involved in the beneficial effect on cognitive function. Self-rated health is a subjective measure of personal health and is known to be a predictor of survival in individuals with mild to moderate dementia.[28] Health concern increases as we age, but health concern does not necessarily lead to engagement in activities that help maintain physical and mental health in the elderly, especially in regard to cognitive function. Participation in productive or social activities fulfills a meaningful social or economic role, which could potentially sustain a person's self-concept of usefulness and competence.[29] A sense of self-efficacy has been linked to several important health outcomes in middle-aged or elderly adults.[30,31] Cognitive and physical activities overlap, and therefore it is not surprising that previous studies have disagreed on the role of physical activities.

Although interventions or lifestyle modifications should presumably be done as early as possible, a given intervention may exert its effect during other times in a person's life. Careful consideration of the complex relationships among exposure, age, and disease will be fundamental to understanding the factors that alter risk for cognitive decline. Studies should also take into account the intensity, duration, and timing of the exposure, because exposures may be more influential and interventions more effective during critical periods throughout life. The current literature does not provide adequate evidence to make recommendations for interventions in the older adults over 60 years. Despite some transient benefits,[32] prevention trials indicate no effect of cholinesterase inhibitors with longer follow-up.[32,33,34] It may be difficult to intervene effectively in late life, because all people, if they live long enough, likely will reach a stage when they can no longer change lifestyle.

Studies should also evaluate which methods are most worthwhile to promote behavior change and adherence. One promising approach currently available to all physicians is the so-called green prescription approach.[35] This intervention consists of screening for low physical activity, followed by primary care physicians discussing increasing physical activity and reaching agreement

with patients on setting appropriate goals. Home-based physical activity or walking are written on a standard prescription sheet and given to the patient. Follow-up support is provided by telephone and quarterly newsletters and feedback given during follow-up visits with a personal physician.[35]

A limitation of this study is the reliance on self-reports, which are subject to memory errors and conscious or unconscious distortions of what is reported. Another limitation is the relatively short follow-up period, which allowed ascertainment of only the short term effects of the intervention. The about 50% of retention rate at 2 years is relatively low compared with other longitudinal community-based studies. However, because these studies were not intervention trials, they did not have the same level of respondent burden as our study. Therefore, while the direct comparability of retention rates to other intervention trials cannot be made.

If mental and social activity were to protect against cognitive deterioration in the elderly, it would be of great public health importance because mental and social activity is relatively inexpensive, has few negative consequences, and is accessible to most elders. Even if the effect size were relatively small, mental and social activity could have a dramatic impact on quality of life and health care expenditures. To our knowledge, this is the first cluster randomized clinical trial testing the effectiveness of health behavior guidelines for Alzheimer disease as delivered through a cognitive behavioral therapy. We believe this is the first trial in this area that integrates these recommendations within public health care. This setting is important because it represents the care site in which most older adults receive their health care, including those with dementia. This setting is also important because it represents the logical target for any initiatives to improve the early identification and treatment of mild cognitive impairment and dementia. Most studies have focused on single or individual behaviors but this study expands the scope of existing literature to examine combinations and profiles of healthy lifestyles. Considering that lifestyle

behaviors co-occur, multiple health behavior approach appears more practical. Future studies would need to consider including methods that can quantify multiple behavior change.[36] Also, using GEE it was possible to include all non-missing values in each year, resulting in a more robust analysis. A longer follow-up might have shown significant effects of the intervention.

V. CONCLUSION

In this cluster randomized clinical trial of an intervention for community dwelling Korean elderly, the intervention did not result in a clinically meaningful improvement in MMSE scores. Considering that lifestyle behaviors co-occur, multiple health behavior approach appears more practical. In the brief intervention, encouragement of mental and social activity would be helpful in cognitive health of the community dwelling elderly.

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ABSTRACT

지역사회 노인대상 치매예방 인지건강증진 프로그램의 관리방법에 따른 효과

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서론 : 인지기능 및 치매의 관련요인을 분석한 역학연구에 대한 체계적 고찰에서 살펴보면 신체활동, 사회관계망, 지적 및 인지활동 등이 긍정적인 영향을 미치는 것으로 조사되었다. 현재 우리나라에서는 치매관리사업이 국가 및 지역단위에서 점차 활성화되는 추세에 있으나, 치매환자 및 보호자의 관리차원에서 치중하고 있는 상황이다. 인지건강에 대한 기초자료의 체계적 수립, 정리, 배포를 통해 인지건강에 대한 개념 확립과 인지건강증진사업의 활성화가 필요하다. 보건복지가족부 치매예방 인지건강수칙은 앞으로 지역사회 인지건강증진에 많은 기여를 할 것으로 기대된다. 하지만 이에 앞서 치매예방 인지건강수칙의 관리방법에 따른 효과성 검증이 필요할 것으로 생각된다.

재료 및 방법 : 수원시 거주 지역사회 노인 1000명을 대상군으로 하였으며, 수원시 4개 구(장안구, 권선구, 팔달구, 영통구) 444개 경로당을 이용하는 노인들의 명단을 확보한 후 선택오류(selection bias)를 줄이기 위해 110개 경로당에 번호를 매긴 후 집단추출방법(cluster sampling)을 사용하여 5개 대상군 1000명(정상대조군 200명, 1형 개입군 200명, 2형 개입군 200명, 3형 개입군 200명, 4형 개입군 200명)을 선정하였다.

결과 : 개입군 4그룹과 정상대조군 간의 1년후의 인지기능의 변화는 유의하지 않았다. 그러나 정신적, 사회적 활동이 유의하게 증가한 그룹에서는 그렇지 않은 그룹에 비해서 인지기능의 감퇴가 적은 것이 관찰되었다.

결론 : 치매 예방 인지수칙에 근거하여 인지행동치료를 1년간 시행후 인지기능의 감퇴정도를 비교하였으나 통계적인 차이가 관찰되지 않았다. 그러나 단기적으로는 정신적, 육체적 활동을 늘리는 것이 인지기능의 감퇴속도를 늦추는 것으로 나타났다.

핵심되는 말 : 인지기능, 치매, 예방, 정신적 활동, 사회적 활동, 개입, 건강행동