

# The Influence of Physical Therapy on the Changes in Clinical Dementia Rating Scale in Long-stay Elderly Patients

This study was carried out to identify the influence of continuous physical therapy on long-stay elderly patients. This study classified 92 patients who had been hospitalized for one year into experimental group who continued to perform physical therapy and control group who did not conduct physical therapy and these two groups were classified into 0.5 point-questionable group, 1 point-mild dementia group, and 2 point-moderate dementia group based on the Clinical Dementia Rating Scale(CDR) when they were hospitalized in order to analyze the changes at the early stage of hospitalization and after one year has passed. As a result, it was appeared that both in CDR 0.5-point subgroup of questionable group and in CDR 1-point subgroup of mild dementia group, CDR was statistically significantly reduced in the experimental group whose physical therapy was continuously performed than in the control group whose physical therapy was not performed( $p < .05$ ) and that there was no significant difference in changes in the CDR between experimental group and control group in CDR 2-point group, which is a moderate dementia group.

Key words: *Dementia; Cognitive Function; Clinical Dementia Rating Scale*

Ji Sung Kim

Suwon Women's College, Suwon, Korea

Received : 27 December 2013

Revised : 20 February 2014

Accepted : 4 March 2014

## Address for correspondence

Ji Sung Kim, PT, Ph.D

Department of Physical Therapy, Suwon Women's College, 336-27 Sanggi-ri, Bongdam-eup, Hwaseong, Korea

Tel: 82-31-290-8956

E-mail: sparkler7@swc.ac.kr

※ Funding for this paper was provided by Suwon Women's University in 2013.

## INTRODUCTION

The current dementia prevalence in Korea is expected to increase gradually: 8.4% in 2008, 9.7% in 2020, and 13.2% in 2050. The number of patients is estimated to increase from about 470 thousand people in 2010 to about 940 thousand people in 2050(1). In fact, the number of elderly convalescent hospital that'd been registered until Aug. 2010 was 833 in total, which is suggestive of a steady increase and the dementia disease appears high in clinical characteristics of hospitalized patients(2, 3).

In addition, analysis on the trends in geriatric illness (2002~2009) showed that the number of geriatric patients who used medical institutions was 205.7%, total fee for consultation 419.5%, and the share of Health Insurance Corporation 426.1% compared to the initial year of 2002. In particular, the number of people at doctor's office 255.4%, total fee for consultation 543.7%, and the share of Health Insurance Corporation 542.9%, which was a signifi-

cant increase in elderly patients aged 65 years old. In addition, the use of treatment for geriatric illness per capita continued to increase; there was a significant increase in dementia and Parkinson's disease; and there was a steep rise in dementia at the base point of 2005. Like this, with the increase of elderly convalescent hospital, the percentage of convalescence benefits in medical care assistance is expected to increase continuously.

The clinical treatment for such dementia patients include various drug treatments, medical rehabilitation facility, etc. Among which, various physical activities in elderly dementia patients can be used to improve physical function and cognitive function, reduce the dementia prevalence, and play a role in preventing dementia and in particular physical activity for at least 30 min, three times a week is reported to preserve brain function by improving blood circulation, improve emotional and cognitive function and reduce behavior disorder, and improve

quality of life and enhance independence(4). On the other hand, it is found that the probability that the lower level of physical activity develops to dementia and AD in normal elderly patients is 53.1 per 1,000 individuals and the probability that the higher level of physical activity develops to dementia is 17.4 per 1,000 individuals, which suggests that the lower level of physical activity is likely to increase the risk of dementia and move up the date(5).

However, most previous researches focused on the elderly with mild cognition impairment who live within the family rather than the long-stay patients with limited effect of group exercise intervention and everyday life. Therefore, this study aims to identify the influence of continuous physical therapy on the changes in clinical dementia rating scale in long-stay elderly patients to present the necessity of physical therapy centering on the physical activities that are performed for maintaining and improving the cognitive function of long-stay elderly patients.

## METHODS

### Subject

In this study, whether the physical therapy was performed in patients aged over 65 years old who were hospitalized in H Specialized Elderly Patient Hospital in Gyeonggido for over one year was investigated and 92 patients who fitted the purpose of the study were selected and divided into the experimental group who performed physical therapy continuously and the control group who did not perform physical therapy. These two groups were classified into 0.5 point-questionable group, 1 point-mild dementia group, and 2 point-moderate dementia group based on the clinical dementia rating scale when they were hospitalized to analyze the changes in clinical dementia rating scale at the initial stage of hospitalization and after one year has passed.

### Methods

#### Physical therapy program

With respect to the physical therapy of research subjects, among the physical therapy contents prescribed in rehabilitation medicine department, rehabilitative development therapy for disorder of central nervous system, mattress or mobilization training, or gait training were continuously performed.

#### Clinical dementia rating scale(CDR)

CDR is a scale that evaluates the degree of overall recognition and social function in dementia patients and evaluates six areas such as memory, orientation, judgment and problem solving ability, social activity, family life and hobby, and sanitation and dressing up in such six grades: 0, 0.5, 1, 2, 4, and 5. On the basis of the entire CDR, 0 means "not dementia", 0.5 "questionable", 1 "mild dementia", 2 "moderate dementia", 3 "severe dementia", 4 "profound", 5 "terminal"(6).

#### Data Analysis

All data collected from the study were encoded using computerized statistical treatment program (SPSS 20.0/PC); descriptive statistics were used to analyze the general characteristics of research subjects; and independent t-test was carried out to identify the difference in clinical dementia rating scale at the initial stage of experimental group and after one year between control group and experimental group( $p < .05$ ).

## RESULTS

### General Characteristics of Research Subjects

The mean age of research subjects in this study is  $79.75 \pm 5.06$ , the highest age 89, and the lowest age 65 years old. In gender, the number of males is 31 individuals(33.7%) and that of females 61(66.3%), and the number of CDR 0.5 point was 16 individuals(17.40%), that of CDR 1 point 36(39.13%), and that of CDR 2 point 40(43.48%), when hospitalized.

Table 1. General characteristics of research subjects

		N	Percent
Gender	Male(n)	31	33.7%
	Female(n)	61	66.3%
Age(years)	Min	Max	M $\pm$ SD
	65	89	79.75 $\pm$ 5.06

### Comparison of Changes in CDR Depending on Physical Therapy

As a result of comparing the variation in rating after one-year of hospitalization in the group of CDR 0.5 point-questionable group, it was  $.50 \pm .61$  point in

control group who did not perform physical therapy and  $-.05 \pm .35$  point in experimental group who did perform physical therapy, which suggested that CDR was reduced in experimental group compared to the control group and there was a statistically significant difference ( $p < .05$ )(Table 2).

**Table 2.** Changes in CDR scores after one year hospitalization in questionable group

Group	N	M $\pm$ SD	t	p
Experimental	11	$-.045 \pm .35$	-2.291	.038
Control	5	$.500 \pm .61$		

\*  $p < .05$

As a result of comparing the variance in scores after one year hospitalization in the group of CDR 1 point in mild dementia group, it was  $.46 \pm .57$  point in control group who did not perform physical therapy and  $.02 \pm .36$  point in experimental group who did perform physical therapy, which suggested that CDR was reduced in experimental group compared to the control group and there was a statistically significant difference ( $p < .05$ )(Table 3).

**Table 3.** Changes in CDR score after one year hospitalization in mild dementia group

Group	N	M $\pm$ SD	t	p
Experimental	22	$.023 \pm .36$	-2.585	.018
Control	14	$.464 \pm .57$		

\*  $p < .05$

As a result of comparing the variance in scores after one year hospitalization in CDR 2 point group – moderate dementia group, it was  $.55 \pm .52$  point in control group who did not perform physical therapy and  $.21 \pm .41$  point in experimental group who did perform physical therapy, which suggested that CDR was more reduced in experimental group than control group but there was no significant difference ( $p < .05$ )(Table 4).

**Table 4.** Changes in CDR scores after one year hospitalization in moderate dementia group

Group	N	M $\pm$ SD	t	p
Experimental	29	$.207 \pm .41$	-1.934	.072
Control	11	$.545 \pm .52$		

\*  $p < .05$

## DISCUSSION

Dementia is one of the most common diseases in psychotic symptoms that appear in old age and usually appears as chronic and gradually deteriorating and progressive. It is a cognitive function disability that includes damages in memory, ability to think, learning ability, and judgment(7, 8). If such a dementia patient is bedridden without physical activity, his/her immunity gets weakened and he/she is susceptible to pneumonia or infectious diseases, and the risk of fracture gets higher because the joint is stiff and the speed of dementia gets faster, thus leading to the terminally ill state(9). Therefore, exercise and physical activity are essential for dementia patients. Therefore, regular exercise is effective for preventing hurt from a fall because it improves physical functions such as physical endurance, strength of lower extremity, and balance in elderly dementia patients with low balance and muscular function compared to the ordinary people. As long-term exercise preserves the blood vessel of the brain and increases oxygen transport and source of energy to improve the growth and function of brain cell, it has a positive influence on the function of blood vessel in the brain, thus contributing to the improved psychomotor ability(10, 11, 12, 13).

Major methods to inspect the cognitive function related to dementia in a clinical setting include Mini-Mental State Examination–Korean(MMSE–K), Clock Drawing Test(CDT), Clinical Dementia Rating Scale(CDR), and Hasegawa Dementia Screening Scale. Among which, CDR is a tool developed to determine the degree of dementia and severity(14); the cognitive function and social area of dementia patients can be evaluated comprehensively; and CDR score shows a higher correlation with MMSE–K score(6). Therefore, this study discusses the outcomes of previous researches using MMSE due to lack of previous researches that analyzed the changes in cognitive function by utilizing CDR after applying exercise program in dementia patients.

To look at the previous researches that analyzed the changes in cognitive function after applying exercise program in dementia patients, the researches that reported significant improvement in cognitive function after applying continuous exercise program include Um et al.(13), Yoo and Yang(15), Geda et al.(16), Yaffe et al.(17), Lee(18), Lee et al.(19), Wang et al.(20), Lautenschlager et al.(21) whereas there was a research that the exercise program did not give significant variety to the improvement in cognitive function(22, 23, 24, 25). To analyze the outcomes of

the previous researches in the above, there were many reports that the long-term exercise program had a positive effect on the improvement in cognitive function in largely mild cognitive function disabled patients and motor did not have a significant influence on the improvement in cognitive function in patients with moderate and severe cognitive function disability and short exercise period.

This study found that CDR was statistically significantly reduced in experimental group that performed physical therapy continuously compared to the control group that did not perform physical therapy in the group of CDR 0.5 point(questionable group) and the group of 1 point(mild dementia group) and that there was no significant difference in CDR in experimental group which was compared to the control group in CDR 2 point group(moderate dementia group). Such findings are difficult to be compared directly due to difference in research subjects and evaluation methods in previous studies, but the continuous physical therapy centering on the physical activity that is largely consistent with the findings of previous researches has a positive influence on cognitive function in long-stay elderly patients.

## CONCLUSION

In this study, as a result of investigating the changes in clinical dementia rating scale in the initial stage of hospitalization and after one year in subjects who received physical therapy continuously and subjects who did not receive physical therapy among elderly patients aged over 65 patients who were hospitalized in geriatric hospital, it was found that CDR was statistically significantly reduced in the experimental group who received physical therapy continuously compared to the control group who did not receive physical therapy in the group of CDR 0.5 point(questionable group) and the group of CDR 1 point(mild dementia group)( $p < .05$ ) and that there was no significant difference in CDR between experimental group and control group in the group of CDR 2 point(moderate dementia group). Conclusively, it is considered that continuous physical therapy has a positive influence on the changes in CDR in the questionable group and the mild dementia group among long-stay patients. However, for better prospective study, more considerations on the factors that may have an influence on the changes in CDR among research subjects and continuous investigation of more patients seem to be necessary.

## REFERENCES

1. You SY, Hong SA, Moon KL. Effects of Hatha Yoga Practice on the Elderly Having Chronic Back Pain because of Computer Usage, *J Kor Institute of Electronic Communication Sci* 2013; 8(7): 1121-1128.
2. Kwak YT, Han IW, Kim DS, Seo SH, Lee CS, Suk SH, Son IH. Clinical Characteristics of Geriatric Patients Admitted to Yongin Hyoja Geriatric Hospital, *J Korean Neurol Assoc* 2000; 18(2): 179-185.
3. Kim SY, Kim JH, Yu KH, Kwon KH, Jung S, Shin JH, Ahn BC, Lee HO, Choi SM, Hahm W, Kim DH. The clinical features and hospital courses of patients admitted to a geriatric hospital : analysis of 600 registered cases. *Dement Neurocognitive Disord* 2009; 8(1): 28-36.
4. Kim JK, Chong BH. Effect of physical activity of patient with dementia. *J Occupational Ther for the Aged and Dement* 2007; 1(2): 70-79.
5. Wang L, Larson EB, Bowen JD, van Belle G. Performance-Based Physical Function and Future Dementia in Older People. *Arch Intern Med* 2006; 166(10): 1115-1120.
6. Choi SH, Na DL, Lee BH, Hahm DS, Jeong JH, Yoon SJ, Yoo KH, Ha CK, Han IW. Dementia Research Group. Estimating the Validity of the Korean Version of Expanded Clinical Dementia Rating(CDR) Scale. *J Korean Neurol Assoc* 2001; 19(6): 585-591.
7. Evans DA, Funkenstein HH, Albert MS, Scherr PA, Cook NR, Chown MJ, Hebert LE, Mennekens CH, Taylor JO. Prevalence of Alzheimer's disease in a community population of the elder persons: Higher than previously reported. *J Am Med Assoc* 1989; 262: 2551-2556.
8. McDowell I. Alzheimer's Disease: Insights from Epidemiology. *Aging* 2001; 13(3): 143-162.
9. Laurin D, Verreault R, Lindsay J, MacPherson K, Rockwood K. Physical Activity and Risk of Cognitive Impairment and Dementia in Elderly Persons. *Arch Neurol* 2001; 58(3): 498-504.
10. Thomas VS, Hageman PA. A preliminary study on the reliability of physical performance measures in older day-care center clients with dementia. *Int Psychogeriatr* 2002; 14(1): 17-23.
11. Brill PA, Drimmer AM, Morgan LA, Gordon NF. The feasibility of conducting strength and flexibility programs for elderly nursing home residents with dementia. *Gerontologist* 1995; 35(2): 263-266.
12. Yoo JY, Lee NH, Lee CM, Kim MJ. Effect of Yoga

- Exercise on Blood Pressure, Physical Fitness, and Blood Variables in Elderly with Vascular Dementia. *J Physical Growth and Motor Development* 2010; 18(3): 217–226.
13. Um SY, Kwak YS. The effects of regular exercise on cognitive function and blood lipid in woman patient with senile dementia. *J Sport Sci* 2004; 15(1): 57–65.
  14. Morris JC. The clinical dementia rating(CDR): current version and scoring rules. *Neurol* 1993; 43: 2412–2414.
  15. Yoo YY, Yang YA. The Effects of Exercise With Cognitive Activity on Balance Performing Ability in the Elderly With Dementia. *J Korean Society of Occupational Therapy* 2009; 17(3): 15–25.
  16. Geda YE, Roberts RO, Knopman DS, Christianson TJ, Pankratz VS, Ivnik RJ, Boeve BF, Tangalos EG, Petersen RC, Rocca WA. Physical exercise, aging, and mild cognitive impairment: a population-based study. *Arch Neurol* 2010; 67(1): 80–86.
  17. Yaffe K, Barnes D, Nevitt M, Lui LY, Covinsky KA. Prospective study of physical activity and cognitive decline in elderly women: women who walk. *Arch Intern Med* 2001; 161(14): 1703–1708.
  18. Lee KO. The effects of the gymnastic exercise and walking program on body composition, depression and risk factors of dementia in the elderly women. *Kor J Sports Sci* 2009; 18(2): 1011–1026.
  19. Lee HO, Kim SH, Park RJ. Correlation Analysis between MBI and MMSE after Exercise Program for Dementia Elderly. *J Korean society of physical therapy* 2000; 12(2): 83–93.
  20. Wang JS, Kim JS, Kim SH. The Effects of Hand Movement Exercise Program on the Improvement of Cognitive Function in the Dementia Old Adults. *J Korean society of physical therapy* 2009; 16(1): 21–29.
  21. Lautenschlager NT, Cox KL., Flicker L, Foster JK, Van Bockxmeer FM, Xiao J, Greenop KR, Almeida OP. Effect of physical activity on cognitive function in older adults at risk for Alzheimer disease: a randomized trial. *J Am Med Assoc* 2008; 300(9): 1027–1037.
  22. Park HS, Kim HS. The Effects of In-facility Exercise Program on Fall-Related Fitness and Cognitive Function in Elderly with Dementia. *J Korean society of living environmental system* 2010; 17(1): 77–85.
  23. Son HH. The Effects of Exercise Program on Activities of Daily Living and Balance in Elderly with Dementia. The graduate school of Daegu University 2007.
  24. Cassilhas RC, Viana VA, Grassmann V, Santos RT, Santos RF, Tufik S, Mello MT. The impact of resistance exercise on the cognitive function of the elderly. *Med Sci Sports Exerc* 2007; 39(8): 1401–1407.
  25. Ven Gelder BM, Tijhuis AR, Kalmijn S, Giampaoli S, Nissinen A, Kromhout D. Physical activity in relation to cognitive decline in elderly men. *Neurol* 2004; 63(12): 2316–2321.