Original Article

Effect of a Cognitive Stimulation Therapy Program on Cognitive Ability of Demented Older Adults

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Abstract

OBJECTIVES: This quasi-experimental study aimed to examine the effect of a cognitive stimulation therapy (CST) program on the cognitive ability of demented older adults.

MATERIAL AND METHODS: Two nursing homes were randomly assigned as experimental and control groups. Simple random sampling technique was used to recruit 27 demented older adults from each nursing home. The experimental group received a CST program three times per week for 5 weeks. The control group received usual care. Data collection was performed from March to May, 2018. Instruments used were a Demographic Questionnaire, Mini Mental State Examination (Indonesian version), and the CST program adapted for the culture of East Java, Indonesia. Descriptive statistics were calculated for data analysis.

RESULTS: Findings revealed an effect of CST on cognitive ability of demented older adults. The experimental and control groups were not significantly different before the intervention ($p = 0.161$). After the CST program, the mean cognitive ability score in the experimental group was significantly higher than before the program ($p < 0.001$). After the CST program, the mean cognitive ability score in the experimental group was significantly higher than in the control group ($p < 0.001$). The mean cognitive ability score for the control group did not differ significantly between pre-test and post-test ($p = 0.058$).

CONCLUSION: CST improves cognitive ability in demented older adults. Nurses and health care teams can apply CST beneficially with older adults with dementia. Future research could replicate this study for different levels and types of dementia.

Keywords: dementia, cognitive ability, cognitive stimulation therapy, nursing home.

Cognition, the ability to process thought, entails perceiving, saving, recalling and using information. The World Health Organization (WHO) lists components of cognition as language, thought, memory, executive function, judgment, attention, and perception.[1] Preserving multidimensional cognitive structure allows older adults to maintain social connectedness, an ongoing sense of purpose, the ability to function independently, functional recovery from illness or injury, and the ability to cope with residual functional deficits.[2] The brain may be able to achieve new or regain lost functions by changing its internal connectivity network. Due to interaction between neuronal plasticity and cognitive plasticity, the aging brain can reorganize cognitive demand or cognitive plasticity as needed.[3] However, cognitive ability decline does occur, and includes memory disorders, neuropsychiatric symptoms, orientation disorder, aphasia, apraxia, agnosia, executive function disorder, and personality change.[4,5]

Dementia is a group of symptoms characterized by significant cognitive decline from a previous level of performance in one or more cognitive domains, such as learning and memory, language, executive function, complex attention, perceptual-motor, and social cognition.[6,7] Dementia results from a variety of diseases and injuries that primarily or secondarily affect the brain; it is chronic and progressive.[1] Globally, over 47 million people have dementia and over 7 million new cases are recorded every year.[8,9] The prevalence of dementia is much greater in

institutionalized elderly than among community-dwelling elderly; one German study found dementia in 51.8 % of nursing home residents compared to 2.7 % in community-dwelling elderly.[10] In Indonesia, while there are no records of the total population of nursing home elderly, it was reported that in 2016 there were 1.2 million Indonesians living with dementia.[11,12] The growing prevalence of dementia has substantial macro- and micro-level effects. Dementia affects not only the older adult's life physically, psychologically and socially, but also the family, economy and society.[1,13]

Dementia affects each older adult in a different way, depending on the type, level, and area of the brain affected, and the personality of the older adult before becoming ill. The progression of dementia is assessed by instruments with varying rating schemes, such as the Global Deterioration Scale 7, the Functional Assessment Staging Test 7, the Clinical Dementia Rating, and the Mini Mental State Examination. The Mini Mental State Examination, used in this research, is a three-stage model: early, middle, and late stages. Early stage traits include forgetfulness, losing track of time and becoming lost in familiar places. Middle stage features forgetting recent events and people's names, becoming lost at home, having increasing difficulty with communication, needing help with personal care, and experiencing behavior changes including wandering and repeated questioning. Late stage is characterized by becoming unaware of time and place, having difficulty recognizing relatives and friends, having an increasing need for assisted self-care, having difficulty walking, and experiencing undesirable behavior changes that may escalate and include aggression.[1] A social consequence of dementia is that older adults with dementia are often dehumanized due to being perceived as having lost autonomy, dignity and control and thus respectability.[13]

Dementia caregiving, especially for often-untrained family members, is difficult.[14] A study of 401 dementia family caregivers, found that 64.26 % have ambivalent feelings. Caregiving can affect the mental health of family caregivers, e.g., depression and/or anxiety. This is especially true for family caregivers who have to deal with the behavioral and psychological symptoms of dementia (BPSD) such as agitation (e.g., aggression, screaming), psychiatric symptoms (e.g., delusions, hallucinations), personality changes (e.g., inappropriate sexual behavior, disinhibiting), mood disturbances (e.g., apathy, depression, euphoria, emotional lability), aberrant motor movements (e.g., pacing, rummaging, wandering), and neuro-generative changes (e.g., appetite changes, sleep disturbances).[15] Cognitive deterioration thus has significant challenges for family and professional caregivers, and anything that can preserve or prolong cognitive ability is highly desirable.

There is currently no cure for dementia. Several new treatments are in various stages of clinical trials.[1] Since a cure is not possible, pharmacological and non-pharmacological therapies are aimed at slowing cognitive decline. Caring for older adults with dementia often is a combination of pharmacological and non-pharmacological approaches.2 Pharmacological therapy often focuses on replacing dopamine and cholinesterase inhibitors (CIs). Non-pharmacological therapies, too, are constantly being developed and evaluated.[16] Several studies that reviewed non-pharmacological therapies conclude that their efficacy is limited.[17-19]

Non-pharmacological therapies such as cognitive-based, psychosocial, movement or sensorial therapies have been suggested to help slow or manage the progression of dementia. Cognitive-based interventions rely on brain plasticity theory and include cognitive training, cognitive rehabilitation, and cognitive stimulation.[20] Cognitive stimulation has produced significant improvement as measured by the mini mental status examination (MMSE) and Alzheimer's Disease Assessment Scale-cognitive subscale (ADAS-Cog).[21] Reality orientation and CST could significantly improve MMSE, ADAS-Cog, and Quality of Life in Alzheimer's Disease (QoL-AD) scores, and was also cost-effective.[22]

Cognitive stimulation is a therapy that engages the person with dementia in a range of group activities and discussions designed to enhance cognitive and social functioning. It is a non-pharmacological group intervention whose sessions include topics such as life history and current events. CST-Hong Kong reported that seven weeks of CST improved cognition, communication, and quality of life in older people with mild to moderate cognitive impairment.[23] CST is usually delivered in clinical or other health care settings, but it could easily be adapted and integrated into non-institutional routine practice.[23] CST was found, even from the perspective of stakeholders, to improve communication, enhance socialization, intensify commitment, strengthen self-efficacy, and improve interpersonal relationships.[23] CST-J (Japanese version), concluded that benefits included improved cognition and quality of life of people with dementia.[16] In Indonesia there is no formal program such as CST in nursing homes; there are, however, nurse-led group activities such as art therapy (drawing and singing), playing games (puzzles, guessing an animal by its sound), and exercise ("healthy gym").

CST is non-pharmacological, so it often costs less than pharmacological therapy. In addition, it is easily administered since there are no side effects for demented older adults. In Indonesia there are few dementia studies, especially of non-pharmacological therapies. There are few if any government or private agency created guidelines for non-pharmacological therapy for people with dementia. But there appears a need for such therapy. In nursing homes, the literature revealed that older residents had moderate cognitive impairment.[16] To add to a very limited database, this study examined the effects of a CST program on the cognitive ability of older nursing home residents with mild to moderate dementia, using the "Making A Difference" manual.[24]

Material and methods

A quasi-experimental design was used in this study. Demented older adult participants from two nursing homes in different cities (randomly assigned as experimental and control) were randomly chosen from those residents meeting inclusion criteria. Nursing home staff collected data before and after the intervention. The nursing homes are similar in design, function and activities. The population for this study was Indonesian adults aged 60 and over with mild or moderate cognitive impairment based on the MMSE Indonesian version. The sampling frame was mild-to-moderate demented older adults in two nursing homes in East Java, Indonesia. The following inclusion criteria were applied:

1. Mild to moderate dementia (MMSE Indonesian version; score of 20-25 is mild cognitive impairment, 10-20 is moderate cognitive impairment)
2. Able to speak and write in Indonesian
3. No mobility limitation that would interfere with participation
4. No auditory or visual impairment that would interfere with participation

There was one exclusion criterion: A chronic disease (e.g., heart or respiratory condition) that could be exacerbated by participation.

Sampling

From five nursing homes in two East Java cities, the researchers randomly chose one from each city. One nursing home was randomly chosen to be the experimental group site; the other was the control group site. Simple random sampling technique was used to select participants, as described below:

Experimental Group	Control Group
Step 1: Of 54 older adults, MMSE screening and other inclusion/ exclusion criteria identified 43 potential participants.	Step 1: Of 43 older adults, MMSE screening and other inclusion/ exclusion criteria identified 30 potential participants.
Step 2: The names of the 43 older adults were put in a box and mixed; 27 names were randomly selected.	Step 2: The names of the 30 older adults were put in a box and mixed; 27 names were randomly selected. (As the control group would receive no additional activities/programs, there was no need to divide them into sub-groups.)
Step 3: The 27 people were divided in three groups of nine (to keep group size manageable for the CST program administration).	

Research instruments

The instruments used in this study were a demographic questionnaire, the MMSE Indonesian version, and CST (consisting of the program and supporting materials).

1. **Demographic Questionnaire,** developed by the researchers, gathered data on age, gender, education, most recent employment status, and duration of dementia.
2. **Mini Mental Status Examination (MMSE), Indonesian version:** This instrument measures cognitive ability. Its 30 items are divided into dimensions of orientation (10 items), registration (3 items), attention and calculation (5 items), recall (3 items), and language (9 items). It thus measures orientation, language, concentration, constructional praxis, and memory. In this study the researchers focused on degree of impairment in this research. Impairment categories and their scores were 25-30 (questionable significance), 20-25 (mild impairment), 10-20 (moderate impairment), 0-10 (severe impairment).
3. **CST Program:** The CST program was delivered, per the manual, in 14 sessions: three 45-minute sessions per week for five weeks (including the first, non-CST session, when the MMSE was administered).

Week	Sessions
1	Session 1: Physical games Session 2: Sounds Session 3: Childhood
2	Session 4: Food Session 5: Current affairs Session 6: Faces or scenes
3	Session 7: Word associations Session 8: Being creative Session 9: Categorizing objects
4	Session 10: Orientation Session 11: Using money Session 12: Number games
5	Session 13: Word games Session 14: Team quiz and wrap-up

Ethical Considerations

1. The research was approved by the Institutional Review Board (IRB approval 06-02-2561) of the Faculty of Nursing for Graduate Studies, Burapha University, Thailand.
2. Approval was received from the directors of the nursing homes in East Java, Indonesia.

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3. After participants were informed verbally and via an information sheet about the topic and purpose of the study, a written informed consent document was signed by each participant.
4. The researchers ensured that participants' identities and all data obtained would be kept confidential and accessible only by the researchers.
5. The researchers ensured the rights and privacy of the participants.
6. Participants were informed that they receive no financial or other type of remuneration by participating in this study.

Data collection procedures

Data collection was carried out by the researchers with assistance from nursing home staff, who administered the MMSE. Data collection proceeded as follows:

	Experimental Group (n = 27) Three groups of nine participants each received the CST program, based on the original manual, in three weekly sessions over five weeks.	Control Group (n = 27)
21 March 2018	Day 1: The researchers and assistant administered the MMSE Indonesian version.	Day 1: The researchers and assistant administered the MMSE Indonesian version.
22 March - 1 May 2018	Day 2: Through Day 15: the researchers administered the CST program (14 sessions) at staggered times to the three groups.	Control group participants follow their regular activity schedule.
May, 2018	1. The researchers and assistant administered the MMSE Indonesian version. 2. All data were coded and entered into a database using SPSS version 18. Data were cleaned and prepared for analysis by the researchers.	1. The researchers and assistant administered the MMSE Indonesian version. 2. All data were coded and entered into a database using SPSS version 18. Data were cleaned and prepared for analysis by the researchers.

Data analysis

Data entry and statistical analysis was performed using SPSS version 18. The significant level of statistical tests was set at 0.05. Descriptive and t-test statistics were used. Kolmogorov-Smirnov was used to test for normal distribution. Age, MMSE pre-test and MMSE post-test were normally distributed. Descriptive statistics describing the sample were means, standard deviations, frequencies, and percent distributions. Paired t-tests assessed the differences in cognitive ability mean scores at pre-test and post-test within the experimental and control groups. Independent t-test assessed the difference in cognitive ability mean scores from pre-test to post-test between experimental and control groups.

Results

Characteristics of the sample: Table 1 shows demographic data for the fifty-four participants who met the inclusion criteria and comprised the sample for the study. About half the older adults in both experimental and control groups were aged 70-79. A majority of the control group was male (59.3%), while the same majority in the experimental group was female (59.3%). In both groups a solid majority had experienced 12-24 months of dementia (85.2% in the control group, 70.4% in the experimental group). A plurality of the control group and a majority of the experimental group had completed high school and more than high school (77.8% and 74.1% respectively). Over 80% in both groups were married, and the majority of older adults in both groups had worked in the private sector worker and laborers (Table 1).

At the pre- test period, the mean cognitive ability score of the control and experimental groups were not significantly different ($p = 0.161$). Regarding cognitive ability, we can presume both groups were statistically similar. However, at the post-test period, mean cognitive ability score in the experimental group was significantly higher than that in the control group ($p < 0.001$) Table 2.

In the control group, pre-test and post-test mean cognitive ability scores were not significantly different ($p = 0.058$). Whereas in the experimental group, post-test mean cognitive ability score was significantly higher than the pre-test mean cognitive ability score ($p < 0.001$). The group receiving CST improved cognitive ability significantly at the end of the intervention, and the improvement was significant compared to any improvement in the control group (Table 3).

Discussion

In this research, consistent with some previous studies, a CST program significantly improved the cognitive ability of demented older adults. While dementia inherently means cognitive impairment, through CST older adults appear to recapture cognitive ability via enjoyable, nonjudgmental, unpressured group social activities, supervised by staff but often with a participant acting as the leader. The implication is that, for one reason or another, people with mild to moderate dementia may perform below their true cognitive level, and CST motivates them to return to their maximum cognitive functioning.[16,22]

Table 1: Characteristics of the sample.

Variable	Control group (n = 27)	Control group (n = 27)	*p*
Age (years)			0.282 [C]
60 – 69	5 (18.5)	6 (22.2)	
70 – 79	14 (51.8)	13 (48.1)	
>80	8 (29.7)	8 (29.7)	
Min-Max	60 - 83	60 - 95	
Mean+SD	73.48 ± 7.24	76.29 ± 8.84	
Gender			0.174 [C]
Male	16 (59.3)	11 (40.7)	
Female	11 (40.7)	16 (59.3)	
Duration of dementia (month)			0.327 [F]
12 – 24	23 (85.2)	19 (70.4)	
>24	4 (14.8)	8 (29.6)	
Level of education			0.387 [F]
Elementary school	11 (40.7)	7 (25.9)	
High school and >High school	16 (59.3)	20 (74.1)	
Marital status			1.0 [F]
Not married	4 (14.8)	5 (18.5)	
Married	23 (85.2)	22 (81.5)	
Type of work			1.0 [F]
Unemployed	6 (22.2)	7 (25.9)	
Private sector worker and laborers	21 (77.8)	20 (74.1)	

[C] = tested with Chi square,
[F] = tested with Fisher exact test

Table 2: Pre-test and Post-test mean cognitive ability scores of experimental and control groups.

Variable	Control group (n = 27)	Experimenta group (n = 27)	t-test	*p*
Pre-test	16.48 ± 3.19	17.26 ± 2.47	1.001	0.161
Post-test	18.04 ± 4.44	22.85 ± 2.60	4.862	< 0.001

Table 3: Control and Experimental group pre-test and post-test mean cognitive ability scores.

Cognitive ability	Pre-test	Post-test	t-test	*p*
Control Group	16.48 ± 43.18	18.04 ± 4.44	1.981	0.058
Experimental groups	17.26 ± 2.47	22.85 ± 2.60	8.150	< 0.001

Via CST, new learning seems to occur inside meaningful conversation in small groups. In the therapeutic context, reality orientation was the most used during the 14 CST sessions. (A description of the 14 sessions is in Appendix A.) It is possible that reality orientation encourages the demented brain to reorganize to satisfy cognitive demand, enhancing the formation of new neuronal pathways between brain regions.[3] The result is improvement in verbal abilities, cognition, memory, learning, information and orientation.[20,25]

Reminiscence therapy, in this case group discussion of experiences and events, is also in evidence. Recounting pleasant experiences and sharing memories of happiness could improve dopamine production and stimulate neuronal activity, expanding brain synapses.[3] This could improve cognitive abilities, enhancing social interaction, coping skills, communications skills, and relationships, and decrease inappropriate and undesirable behaviors.[20,26] Verbally sharing good experiences – for example, favorite places or songs – seemed the preferred activity for the older adults in this program.

The shared experiences and values that come with membership in a common cohort means participants can discuss experiences and feelings others can understand and empathize with. This facilitates quality interaction and relationship-building.

Validation therapy was used throughout the program. Initially each group chose a name and a group song, which they sang before each session. In addition, at the start of each session the leader asked participants to recall the group's name, the group song, the name of their nursing home, the date and the city in which they live. This helped participants to communicate and express their feelings and emotions with the other participants. No matter how nonsensical or illogical it seemed, it was viewed as an attempt to facilitate interpersonal connection. Throughout the CST program, communication between participants improved as they met three times per week, promoting conversation, sharing activities, allowing the expression of mutual respect, and assisting each other when one of them had a moment of cognitive failure.

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Conclusions

In conclusion, CST, which utilizes reality orientation, reminiscence therapy, and validation therapy, provided 14 sessions of activities stimulating cognitive functioning. The results of this quasi-experiment in East Java, Indonesia showed significant improvement in the cognitive ability of demented older adults. Therefore, nurses and health care teams could apply this program for enhancing cognitive ability of older adults in Indonesia. In addition, future research can focus not only on moderate and mild cognitive impairment but on various dementias.

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Appendix A. CST session description.

Session 1: Physical games	Participants sang together along with music, trying to catch a ball when the music stopped. Then they tried to say their name or favorite color or talk about some experience today. This often stimulated another participant to respond.
Session 2: Sounds	Participants see the picture of animal, and by turning on the sound of the animal, they tried to match the sound of the animal to the picture. This stimulated them to recall the right name of the animal.
Session 3: Childhood	Using old toys, the participants enjoy talking and sharing their experiences with the old toys. Some of them tried to play with the old toys.
Session 4: Food	Using real groceries, the group together tried to follow a scenario regarding a budget and the price of the groceries to make lunch.
Session 5: Current affairs	Using simple news from TV or local newspaper, we discussed our traditional food (tempe) becoming famous in western countries. They shared their opinion together about the news.
Session 6: Faces or scenes	Using a photograph of a famous Indonesian actor, the older adults tried to recall the actor's name and perhaps other details (e.g., of the actor's life or films).
Session 7: Word associations	The older adults tried to recall missing words or lyrics from old songs.
Session 8: Being creative	In small groups, participants made simple food together. Pecel is the favorite food in Indonesia, and the participants, regardless of physical or cognitive limitations, tried their best to make pecel. This sometimes required some coordination with another group member.
Session 9: Categorizing objects	While some older adults need more time to categorize an object, some participants tried to help their friends to do this. (For example, to think of the name of a fruit that starts with the letter "A".)
Session 10: Orientation	Older adults like to talk about a past or present favorite or famous places. In this session they often learned from another participant and shared a favorite or famous place from the past or present. This stimulated conversation about the places and their experiences with these places.
Session 11: Using money	Participants were asked to make financial calculations (using fake money). Even when they made mistakes, they still seemed happy with the activity itself.
Session 12: Number games	Using the board game Monopoly, older adults experienced low-threat competition with each other.
Session 13: Word games	Older adults tried to recall or guess words based on clues from the leader.
Session 14: Team quiz and wrap-up	This was a free quiz for older adults, which stimulated their cognition. They also participated in physical activities, shared their experiences, and sang a song together.

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