



Effect of group integrated intervention program combined animal-assisted therapy and integrated elderly play therapy on live alone elderly

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Abstract

The purpose of this study is to identify the effects of a group integrated intervention program that simultaneously conducts cognitive activities, physical activities, emotional activities and social interactions by integrating animal-assisted therapy (AAT) and integrated elderly play therapy based on the cognitive functions and depression of the elderly who live alone. This study follows a pre-test post-test design with a nonequivalent control group, to verify the effectiveness of a group integrated intervention. It applies a group integrated intervention program to 20 elderly people who live alone, aged 65 and above (10 in the experimental group, 10 in the control group), once a week for 90 minutes across eight weeks. The study went through MMSE-K, TMT-A and GDSSF-A to assess cognitive functions and the level of depression. The group integrated intervention increased the cognitive functions of the experimental group and decreased levels of depression. Therefore, this study verified that a group integrated intervention program of AAT and integrated play therapy of the elderly, is an effective for increasing cognitive functions and decreasing depression levels of the elderly who live alone. Based on these findings, the study suggests that there is a need to continuously expand group integrated intervention programs and provide relevant political support.

Keywords: Animal-assisted therapy, Cognitive functions, Depression, Group integrated intervention program, Integrated elderly play therapy

Background

Along with rapid aging and social, economic and cultural changes, the elderly population that lives alone is also demonstrating a con-

tinuously increasing trend. The number of one-person households aged 65 and above was estimated to be 1.223 million in 2015, and is set to increase to 1.99 million in 2025 and 3.719 million in 2045 [1]. The increasing number of elderly people living alone perpetu-

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ates the prevalence of various individual vulnerabilities and social problems. From a healthcare perspective, there may be problems of fasting rates, increasing complex chronic diseases, limitations in function abilities, and unavailability of caregivers. From an economical perspective, there is an increase in economic anxiety due to reduced income and in social terms, there may be an absence of support for dependent family members, psychological anxiety and loneliness as well as problems in solving obstacles of daily life. In particular, there is a significant increase in suicide-related risks such as suicidal thoughts and attempts of the elderly living alone who face psychological difficulties including symptoms of depression [2]. The elderly who live alone and need social protection may be classified into independent living group, safety living group, attention-needed group, vulnerable group and risk group that are clearly the most vulnerable in terms of income, health and social relationships [3].

Depression, which is the most common mental problem of the elderly who live alone, is a continuously increasing trend; many studies have reported that the elderly who have high levels of depression have an approximately 20% faster decline in cognitive functions [4–6]. In particular, if no appropriate therapy and intervention is provided for depression among the elderly living alone, it not only increases the prevalence of depression but also death rates; this warrants the need for social awareness, and clinical and political interventions, with regards to depression among the elderly living alone [3]. The decline in cognitive functions in the elderly living alone has been reported to be a factor that worsens depressive symptoms, and depression has a deep and interactive relationship with cognitive disorders. As interventions in the two areas share many common points, drug-free interventions can lead to a common intervention effect from two aspects [7,8].

Integrated intervention is more effective than single-intervention approaches to strengthen the residual functions of the elderly who need rehabilitation, and the integrated intervention with prevention characteristics at the early stages of diseases is highlighted as an optimal program to provide positive life experiences and maintain rich activities [9]. Recently, many studies identified that integrated interventions which combine single approaches in drug-free treatment methods lead to greater improvement for the subjects [9–11]. The most commonly used single intervention approach of drug-free treatment for the elderly is animal-assisted therapy (AAT), a type of therapy that applies the roles of animals to social lives and disease treatments. AAT acts as a useful emotional and cognitive therapy for the elderly and leads to positive improvements [12]. Integrated elderly play therapy (IEPT) is easily accessible and combines the therapeutic powers of familiar toys to control negative behavior such as depression as well as assisting to increase cognitive functions. The integrated approach of

play is a life-centered therapeutic program that promotes positive functions in cognitive, psychological and social aspects within the process of change of life for the elderly living alone [13]. Therefore, if AAT and IEPT are combined as a single group integrated intervention program, the effects are expected to be even more positive.

The effects of group integrated interventions that include physical activities, cognitive rehabilitation, play, animal-assisted work therapy, recollection therapy, recreation, music and art activities and social interactions have been verified in many studies [6,8,11,14,15]. However, many studies have focused on improving the limitations of drug therapy, and lacked detailed descriptions of group integrated interventions. As well as this, many were related to pathological therapeutic approaches for the elderly with dementia, Alzheimer's or a stroke rather than the general elderly [16–19]. Therefore group integrated interventions for the elderly living alone at a prevention treatment is significant, as it can accumulate academic and clinical evidence.

Integrated intervention methods, with a comprehensive construction or combination of drug-free single intervention methods, are classified into cognitive activities, physical activities, emotional activities and social interaction activities [19]. Physical activities are effective for not only the overall increase in cognitive functions, but also for positive emotional experiences [20], and cognitive training is effective in maintaining cognitive functions by preventing depression and improving memory [21]. Emotional activities are not only extremely stable stimulations, but also improvements in cognitive functions with repeated life-centered education and recollection therapy [22]. In addition, social interaction activities prevent symptoms of depression related to the impairment of cognitive functions to maintain residual functions [23].

Many international and national studies have verified the effects of group integrated interventions. Burgener et al. [11] presented significant results from an integrated intervention method for the elderly with early stages of dementia that included Taiji exercises and cognitive emotional methods on depression and stability of physical health. Lee et al. [8] reported that an integrated intervention method that simultaneously provides physical activities, cognitive training and social interaction activities has positive effects on depression and the cognitive functions of the elderly with dementia; Park and Jee [16] showed that a comprehensive application of music, art, exercise, laughter and recollection as a dementia intervention program within a care facility has the effect of improving the cognitive functions and depression of the elderly with dementia; Trautwein et al. [14] showed that integrated interventions on physical activities specially designed for those with dementia had positive effects on the cognitive functions; Cespón et al. [24] showed that the integrated intervention programs that combine various types of single-intervention methods such as cog-

nitive training, physical activities and noninvasive brain stimulation are more effective than the single intervention method to improve the cognitive functions; Ju and Bang [15] showed that integrated intervention programs for the elderly who had strokes improved their cognitive functions and decreased depression levels. In addition, Ham et al. [19] suggested that the integrated intervention program centered on cognitive activities with physical and emotional activities for Alzheimer's patients is effective in increasing the cognitive functions; Jung and Choi [6] verified that the short-term group integrated intervention that combined physical activities, cognitive activities and social interaction for the advanced elderly, aged 75 and above, decreased the decline in cognitive functions and depression levels.

Therefore, the purpose of this study is to identify the clinical effects of an intervention program that integrates the four areas of physical activities, cognitive activities, emotional activities and social interaction activities - through AAT and IEPT - on the cognitive functions and depression of the elderly who live alone and use community welfare centers.

Materials and Methods

Study design

To verify the effectiveness of a group integrated intervention program, the study used a nonequivalent control group pre-test post-test design to compare the changes before and after the integrated intervention of the experimental and control groups. As shown in Table 1, the pre-test was on the start date of the intervention for each group, and the post-test was on the day of the end of the intervention. The study collected data through the MMSE-K, TMT-A and Geriatric Depression Scale Short Form-Korea (GDSSF-K) scales for 20 elderly subjects, with 10 in the experimental group and 10 in the control group. The experimental group was given 90 minutes of group integrated intervention sessions once a week, for eight weeks. Research and data collection were conducted from March 7th to April 25th, 2019. Considering the research ethics, the control group was given identical integrated intervention afterwards. University professors with clinical experiences in AAT and IEPT were in charge of planning and operating

the program, and a doctor of veterinary medicine, who is a professor of Animal Resources, was an advisor for the selection and management of the treatment assistance dogs. In addition, there were two social workers with clinical certifications and four university student volunteers who participated in the program.

There was an orientation meeting in advance to explain the purpose and the content of the program. After individual interviews and surveys, the study selected 10 elderly people living alone without fear of animals, allergic reactions to animal fur and that could interact with the treatment assistance dogs as the final client group. For ethical protections of the participants of the group intervention, the elderly were noted that if there was any discomfort or difficulty within the process of integrated intervention, they were free to withdraw from the study despite the participation agreement; it was carefully managed so that the subjects who gave written consent participated in the integrated intervention. For their welfare, the treatment assistance dogs were given insect extermination and vaccinations, and they came into contact with the elderly in advance. Two small dogs (Pomeranians, 3 years of age) who were not aggressive, enjoyed being with people, and are liked by the elderly were selected. During the program, there were snacks for the elderly and the treatment assistance dog, and there was a hand sanitizer for the hygiene and safety of the elderly after they had touched the treatment assistance dogs.

Participants

The subjects of the study were the elderly who were willing to participate in the program, of all those who were receiving support services for the elderly living alone with assistance from the Y Social Welfare Center within D Metropolitan City. As shown in Table 2, there were 20 elderly participants, aged 65 and over, who lived alone and participated in the integrated intervention, with 10 in the experimental group and 10 in the control group. The control group was in order of priority for participation of the program in the future. There were 10 subjects in the experimental group who participated in the group integrated intervention program, out of which four were male (40%) and six were female (60%), with an average age of 76.8; as for education level, participants included six high school graduates and above (60%), two elementary graduates (20%), and two middle school graduates (20%). Eight were religious (80%), and two were non-religious (20%), and the subjective health status was in the order of five normal (50%), three not healthy (30%) and two extremely unhealthy (20%). Five participants had difficult (50%) subjective economic status and five had normal (50%). All evaluations were done after receiving consent for information use from the subjects, and the subjects included elderly people who were not physically and cognitively limited, and who could communicate verbally, during the group integrated interventions.

Table 1. The effectiveness verification model of the group integrated intervention program

Group	Pre-test	Intervention	Post-test
Experimental group	O ₁	X ₁ ¹⁾	O ₂
Control Group	O ₃	-	O ₄

¹⁾Multimodal interventional program.

Pre-test, day of the start of intervention; Post-test, day of the end of intervention.

Table 2. The sociodemographic characteristics of the experimental and control groups

Sociodemographic variable	Experimental (n1 = 10)		Control (n2 = 10)	
	Person	Proportion (%)	Person	Proportion (%)
Gender				
Male	4	40.0	5	50.0
Female	6	60.0	5	50.0
Age				
≤ 70	2	20.0	1	10.0
71–80	5	50.0	6	60.0
≥ 81	3	30.0	3	30.0
Education level				
Not schooled	0	00.0	1	10.0
Elementary school graduate	2	20.0	4	40.0
Middle school graduate	2	20.0	3	30.0
≥ High school graduate	6	60.0	2	20.0
Religious				
Yes	8	80.0	6	60.0
No	2	20.0	4	40.0
Health condition				
Healthy	0	00.0	1	10.0
Normal	5	50.0	4	40.0
Not healthy	3	30.0	3	30.0
Extremely not healthy	2	20.0	2	20.0
Economic status				
Difficult	5	50.0	5	50.0
Normal	5	50.0	4	40.0
Not difficult	0	00.0	1	10.0

Intervention

This study used the classification of cognitive activities, physical activities, emotional activities and social interaction activities suggested by Burgener et al. [11] to apply the group integrated intervention method that simultaneously included the single intervention methods of AAT and IEPT. The contents of the integrated intervention program are shown in Table 3.

Animal-assisted therapy (AAT)

AAT is a physical interaction with treatment assistance dogs; this is an intervention in the environment of the elderly to assess physical, emotional and social rehabilitation effects. It is a prevention approach program that evaluates the professional treatment effects [25]. Cognitive activities with AAT intervention is a process of seeking fun or enjoyment by set regulations or methods that are effective in inducing functional movements; physical activities allow the elderly to experience a variety of physical contact with treatment assistance dogs to determine psychological stability and appropriate situation reaction methods. Emotional activities are the dynamic aspects of such interventions, which include playing

or exercising with the treatment assistance dogs to positively improve the behavioral and emotional aspects of the elderly. Such social interaction activities become important educational tools to develop the treatment and interactions of the elderly living alone, by explaining and showing the loving relationship, caring process and training process of the treatment assistance dogs with the animal-assisted therapist [26].

Integrated elderly play therapy (IEPT)

IEPT is an effective intervention tool in keeping interest and short-term participation within clinical practices, and is an experience-centered integrated approach method that maximizes the effects of intervention through psychological and emotional assistance, aside from the everyday care and independence of the elderly by integrating individual play activities such as cognitive games, music, language, literature, physical activities, art, traditional games and everyday life [27]. The cognitive activities of IEPT interventions include cognitive and traditional games, which allow for the elderly living alone to express their achievements and confidence through happiness. They also recover the residual functions, and

Table 3. Activities of the group integrated intervention program

Stages (sessions)	Goals	Integrated intervention activities by sessions and integration foundations	
		Sessions	Activities
Initial (1–2)	Establishing rapport Ice breaking to create familiarity and trust among the group members, treatment assistance dogs and the therapists	1	- Making name tags/introducing myself and learning names of friends (IEPT-social interaction activities) - Who are you?/expression abilities, singing (IEPT-emotional activities)
		2	- Greeting friends/Singing rounds (IEPT-social interaction activities) - Coloring the pictures of the puppies on the printing paper (IEPT-emotional activities) - Explaining and sharing feelings on the treatment assistance dog (AAT-cognitive activities)
Middle (3–6)	Approach activities of the integrated intervention method - Cognitive activities - Physical activities - Emotional activities - Social interaction activities	3	- Ensemble with maracas/our Puppy is a Shaggy Puppy (IEPT-physical activities) - Greeting the treatment assistance dogs, physical contact with the dogs (AAT-emotional activities)
		4	- <i>Hansam Play</i> and chair exercises (IEPT-physical activities) - Remembering the treatment assistance dogs (AAT-cognitive activities) - Learn how to brush and massage the treatment assistance dogs (AAT-social interaction activities)
		5	- Hand-on games/finger yoga exercises to prevent dementia (IEPT-physical activities) - Sending compliments and words of blessing (IEPT-social interaction activities) - Listening to music with the treatment assistance dogs/flower Waltz (AAT-social interaction activities)
		6	- Traditional story 'The Dog and the Cat' (IEPT-cognitive activities) - Making treats for the treatment assistance dogs (AAT-emotional activities) - Relating with the treatment assistance dogs (AAT-social interaction activities)
		7	- Decorating the treatment assistance dog/collage (IEPT-cognitive activity) - Matching emotions with the treatment assistance dog (AAT-social interaction activity) - Making memory albums(IEPT-emotional activity)
Final (7–8)	Activities and preparation for the program wrap-up End so that the enjoyment experiences can be continuously connected, review feedbacks and evaluation	8	- You are flower, I am flower (IEPT-emotional activity) - Share thoughts on the participation of the integrated intervention, wrap-up

IEPT, integrated elderly play therapy; AAT, animal-assisted therapy.

the emotional activities included in everyday life, art and language literature which leads to mental recovery by allowing the elderly to recognize their values reminiscence of the good memories from the past. In addition, physical activities include physical exercises such as light chair exercises or moving the body with exciting music to improve the psychologically intimated emotional state. Social interaction activities include making play tools used in each session, music activities and physical activities so that the elderly people living alone can experience positive compliments and achievements amongst themselves to recover mental health and, in particular, improve the cognitive functions by using toys familiar to the elderly as well as repeating the process of simple play [22].

Thus, this study is the first interdisciplinary study in Korea on group integrated intervention of AAT and IEPT that aims to identify the effects of the group integrated intervention program by considering areas of cognitive, physical, emotional and social in-

teraction activities on the cognitive functions and depression of the elderly living alone; this is achieved by providing various intervention methods, verifying the effectiveness and suggesting effective educational programs.

Measuring tools

Cognitive functions (MMSE-K scale)

MMSE-K (Korean Vision of Mini-Mental State Exam) is a simple perceptivity scale to usefully measure the perceptivity of not only the elderly with dementia, but also the group with high-risk of dementia who are required to have early diagnosis and prevention. The MMSE-K scale was developed by Folstein et al. [28] to test perceptivity, and was later edited and complemented by Kwon and Park [29] to be used for elderly Korean people. It consists of 12 items, with five points on time orientation, five points on spatial orientation, three points on memory registration, three points on

memory recollection, five points on attention and calculation, seven points on language abilities and two points on understanding and judgement. Scores of 19 and under are considered to have dementia, scores between 20 and 23 may suggest dementia, and scores of 24 and above are considered normal.

Trail making test-A (TMT-A)

The Trail Making Test A and B by Reitan [30] is a tool to evaluate the space-time exploration, process speed, mental flexibility and performance functions by connecting randomly placed numbers or letters in the correct order. This study used Trail Making Test-A to connect numbers from 1 to 25 in order, and evaluates attention, sequence arrangement, space-time, perceptivity and motor functions. The test records how many numbers are connected and the mistakes to quantify the duration (Type A – 360 seconds). If the duration is shorter, the subject is considered to have completed the exercise quickly, and thus has good cognitive functions.

Depression

The study used the GDSSF-K by Kee [31] to measure depression levels. The advantages of GDSSF-K are that it is a scale that has been standardized for Koreans, has simple ways of measurements and evaluation and can be easily applied to the elderly. There are a total of 15 questions answered in either 'yes' or 'no'. The scale is out of 15, and the breakpoint was at five points. Higher scores mean higher level of depression, and the Cronbach's α of this study was 0.856.

Results

Comparison of MMSE-K before and after the group integrated intervention program

To identify changes recorded in the MMSE-K during the group integrated intervention program for the cognitive functions of the

elderly living alone, the study analyzed the means and standard deviations of each group. As shown in Table 4, the pre-test and post-test scores of MMSE-K are 21.7 ± 1.29 , 24.9 ± 1.47 respectively, showed statistically significant differences between the two groups ($p < 0.05$).

Comparison of TMT-A before and after the group integrated intervention program

To identify changes recorded in the TMT-A during the group integrated intervention program for the cognitive functions of the elderly living alone, the study analyzed the means and standard deviations of each group. As shown in Table 5, the pre-test and post-test scores of TMT-A are 96.57 ± 17.47 and 70.45 ± 14.42 respectively, which showed statistically significant differences between the two groups ($p < 0.05$).

Comparison of GDSSF-K before and after the group integrated intervention program

The mean and standard deviation of each group was compared to identify the changes of GDSSF-K, that show the effects of the group integrated intervention program on depression among the elderly living alone, the mean and standard deviation of the two groups were 9.65 ± 1.12 and 6.58 ± 1.14 respectively. There were statistically significant differences among the two groups ($p < 0.05$), and the results are shown in Table 6.

Discussion

This study used MMSE-K [29], TMT-A [30] and GDSSF-K [31] to identify the effects of a group integrated intervention program on the cognitive functions and depression of the elderly who live alone and receive support services from a community social welfare center. This study is significant as it suggested a group integrated

Table 4. The change of MMSE-K on cognitive function of the elderly living alone by group integrated intervention program

Variables	Groups	Pre-test	Post-test	Difference	t-value
		Mean \pm SD			
MMSE-K	Experimental (n = 10)	21.7 ± 1.29^a	24.9 ± 1.47^b	-3.2 ± 0.69	-2.72
	Control (n = 10)	19.6 ± 1.72^a	20.2 ± 1.18^a	-0.6 ± 0.73	-2.60

^{a,b}Within columns, values with different superscripts are significant different ($p < 0.05$).

Table 5. The change of TMT-A on cognitive function of the elderly living alone by group combined intervention program

Variables	Groups	Pre-test	Post-test	t-value
		Second, Mean \pm SD		
TMT-A	Experimental (n = 10)	96.57 ± 17.47^a	70.45 ± 14.42^b	7.87
	Control (n = 10)	94.25 ± 16.32^a	89.58 ± 17.38^a	6.41

^{a,b}Within columns, values with different superscripts are significant different ($p < 0.05$).

Table 6. The change of GDSSF-K on depression of the elderly living alone by group combined intervention program

Variables	Group	Pre-test	Post-test	t-value
		Mean ± SD		
GDSSF-K	Experiment (n = 10)	9.65 ± 1.22 ^a	6.58 ± 1.14 ^b	-2.27
	Control (n = 10)	8.96 ± 1.74 ^a	8.12 ± 1.92 ^a	-2.78

^{a,b}Within columns, values with different superscripts are significant different ($p < 0.05$).
GDSSF-K, geriatric depression scale short form-Korea.

intervention that is more effective for the subjects to apply at a clinical stage, and at the same time, provide the evidence needed to select health policies for the elderly living alone.

The major results are as follows.

First, the group integrated intervention program that combined AAT and IEPT increased the cognitive functions of the elderly living alone. The scores of MMSE-K and TMT-A showed a statistically significant improvement, and these results are similar to other researchers [6,14,19,24]. This is considered an important result as it identified the use of the integrated approach and maximization related to the promotion at a structural level, based on functional compensations and various abilities according to the cognitive levels of the elderly living alone. In addition, the integrated intervention of AAT and IEPT that focused on promoting group interventions, was found to be useful as it provided positive life experiences for the elderly living alone who need greater maintenance and improvement of cognitive functions.

Second, the group integrated intervention program that combined AAT and IEPT had an effect of decreasing depression levels of the elderly living alone. The change of GDSSF-K decreased at a statistically significant level, and these results are similar to other researchers [8,11,15,16]. The results verify the usefulness of an integrated intervention program with interactions such as coming into contact with treatment assistance dogs, and experiencing therapy centered around cognitive games, music, language literature, physical activities, artwork, traditional games and everyday life.

Based on the results of the study, the following suggestions are provided. First, if there are problems in the cognitive functions of the elderly living alone, they require great help in everyday life and face difficulties in social activities. Therefore, for safe and independent daily life activities, there should be cognitive processes that think and perform by accepting and processing various sensory stimulations from the given environment. As shown by Bernstein et al. [32], the integrated intervention program that combines AAT and IEPT includes the promotion of participation in fun and purposeful activities as a group. This comprehensively includes easy and familiar play activities that encourage a feeling of solidarity between people and the treatment assistance dogs. Therefore, it was more effective in improving the cognitive functions of the elderly living alone compared to other drug-free integrated interventions.

Therefore, there should be active political support and action plans so that the integrated interventions of AAT and IEPT can provide support and stability in the lives of the elderly as a preventive and effective integrated intervention program.

Second, in the group integrated intervention method approach, it is important to not only focus on 'what' is being intervened but also 'how' it is approached [18]. In particular, for the elderly living alone with negative behavior such as depression, in order to apply structuralized group intervention, improve social relationships and promote active participation, the role of the mediator is extremely important. Therefore the development of a useful guideline manual to improve the abilities of the mediators, or therapists that apply group integrated interventions and provide consistent effective interventions is urgent.

Third, group integrated interventions for the elderly over 65 years of age in Korea were mostly focused on studies related to the elderly with dementia. As the average life expectancy of the elderly is an increasing trend, there are currently active academic and clinical discussions on the quality of life for not only the elderly phase but also the death phase. The integrated intervention program that combines AAT and IEPT for the elderly with various types of problems or needs should be expanded, as it can apply a group integrated intervention within a short period of time, can expect reduced treatment costs due to treatment effects greater than drug treatments, has great effective value as a clinical application with interdisciplinary studies such as animal resources, veterinary medicine, social welfare, occupational therapy, medicine, nursing and psychological counseling, and has high applicability to programs within facilities and the community.

This study is significant as it verified how useful the integrated intervention program of AAT and IEPT for the elderly living alone is through the increase in cognitive functions and decrease in depression levels. However, there should be improvements such as a greater number of subjects and experimental design for generalizability and further validation. In the future, there should be studies that compare the scores of AAT as a single-intervention method and the integrated intervention as well as the scores of IEPT as a single-intervention method and the integrated intervention to contribute to the systematization and specialization of integrated intervention programs that combine AAT and IEPT.

Competing interests

No potential conflict of interest relevant to this article was reported.

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Availability of data and material

Upon reasonable request, the datasets of this study can be available from the corresponding author.

Authors' contributions

Conceptualization: Kil TY.

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Methodology: Kil TY, Ryu HS.

Software: Ryu HS, Kim MK.

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Ethics approval and consent to participate

Not applicable.

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References

1. Statistics Korea. Population in old ages. 2018. <http://kosis.kr/search/search.do>. Accessed 12 Oct 2019.
2. Noh JC, Ko ZK. 2013. Current status and problems of support policies and legal improvement devices for the aged living alone. *J Korea Contents Soc.* 2013;13:257-68.
3. Jung KH. Elderly living alone and policy response strategies. *Health Welf Issue Focus.* 2015;300:1-8.
4. Lee HJ, Kahng SK, Lee JY. The effects of socioeconomic position and health behavior on geriatric depressive symptom. *J Korean Gerontol Soc.* 2008;28:1129-45.
5. Kok RM, Reynolds CF. Management of depression in older adults: a review. *JAMA.* 2017;317:2114-22.
6. Jung BJ, Choi YJ. Effects of a short-term multimodal group intervention program on cognitive function and depression of the elderly. *Ther Sci Rehabil.* 2019;8:57-68.
7. Shin SJ, Lee JS, Kim SK, Jeon BJ. The effect of a group occupational therapy on cognitive function and depression for mild dementia patients in a community. *J Korean Soc Occup Ther.* 2013;21:45-60.
8. Lee YJ, Lee JH, Kim YJ, Yang NY, Park JH. The effect of multimodal intervention on quality of life, depression, and cognitive function in elderly people with dementia: a pilot study. *J Korean Soc Occup Ther.* 2014;22:85-97.
9. Lenehan ME, Summers MJ, Saunders NL, Summers JJ, Ward DD, Ritchie K, et al. Sending your grandparents to university increases cognitive reserve: the tasmanian healthy brain project. *Neuropsychology.* 2016;30:525-31.
10. Scarmeas N, Albert SM, Manly JJ, Stern Y. Education and rates of cognitive decline in incident Alzheimer's disease. *J Neurol Neurosurg Psychiatry.* 2006;77:308-16.
11. Burgener SC, Yang Y, Gilbert R, Marsh-Yant S. The effects of a multimodal intervention on outcomes of persons with early-stage dementia. *Am J Alzheimers Dis Other Demen.* 2008;23:382-94.
12. Kee BS. A preliminary study for the standardization of geriatric depression scale short form-Korea version. *J Korean Neuro Assoc.* 1996;35:298-307.
13. Kil TY. The effect of integrated play therapy with elderly program on self-expression and depression of the elderly with disabilities. *Korean J Gerontol Soc Welf.* 2017;74:9-28.
14. Trautwein S, Scharpf A, Barisch-Fritz B, Niermann C, Woll A. Effectiveness of a 16-week multimodal exercise program on individuals with dementia: study protocol for a multicenter randomized controlled trial. *JMIR Res Protoc.* 2017;6:e35.
15. Ju ES, Bang YS. The effects of multimodal activity program on physical function, cognitive function and depression of the elderly stroke. *J Korea Entertain Ind Assoc.* 2018;12:317-28.
16. Park YS, Jee YJ. Effects of intervention program on cognitive function, depression, activity of daily living and psycho-emotional function among patients with dementia. *Asia Pac J Multimed Serv Converg Art Hum Sociol.* 2015;5:187-96.
17. Park KY, Shin SJ. The effects of multimodal cognitive intervention focused on instrumental activities of daily living (IADL) for the elderly with high-risk of dementia: a pilot study. *J Converg Inf Technol.* 2019;9:201-16.
18. Kim HJ, Lee CY, Jung HR, Lee GH, Kim DH. The effect of the multi intervention program applying to dementia elderly. *J Korean Soc Commun-Based Occup Ther.* 2015;5:11-21.
19. Ham MJ, Kim SK, Yoo DH, Lee JS. The effects of a multi-

- modal interventional program on cognitive function, instrumental activities of daily living in patients with mild Alzheimer's disease. *J Korean Soc Occup Ther.* 2018;26:91-102.
20. Acree LS, Longfors J, Fjeldstad AS, Fjeldstad C, Schank B, Nickel KJ, et al. Physical activity is related to quality of life in older adults. *Health Qual Life Outcomes.* 2006;4:37.
 21. de Kloet ER, Joels M, Holsboer F. Stress and the brain: from adaptation to disease. *Nat Rev Neurosci.* 2005;6:463-75.
 22. Kil TY. The effectiveness verification of integrated elderly play therapy for the older people living alone in a urban and rural complex area: focusing on the depression and interpersonal relationships. *Korean Rural Sociol Soc.* 2017;72:115-40.
 23. Pitkala KH, Routasalo P, Kautiainen H, Sintonen H, Tilvis RS. Effects of socially stimulating group intervention on lonely, older people's cognition: a randomized, controlled trial. *Am J Geriatr Psychiatry.* 2011;19:654-63.
 24. Cespon J, Miniussi C, Pellicciari MC. Interventional programmes to improve cognition during healthy and pathological ageing: cortical modulations and evidence for brain plasticity. *Ageing Res Rev.* 2018;43:81-98.
 25. Kim OJ. Literature review on the benefits of companion animals to elderly persons. *J Anim Assist Psychother.* 2018;7:17-31.
 26. Fine AH. Handbook on animal-assisted therapy theoretical foundations and guidelines for practice. 3rd ed. San Diego (CA): Academic Press; 2010.
 27. Shin HW, Chung SD. Program development and evaluation of integrative play therapy for older people with suspected early dementia. *J Play Ther.* 2015;19:95-109.
 28. Folstein MF, Folsten SE, McHugh PR. Mini-mental state: a practical method for grading the cognitive state of patients for the clinician. *J Psychiatry Res.* 1975;12:189-98.
 29. Park JH, Kwon YC. Standardization of Korean version of the mini-mental state examination (MMSE-K) for use in the elderly. Part II. diagnostic validity. *J Korean Neuropsychiatry Assoc.* 1989;28:508-13.
 30. Reitan RM. Validity of the trail making test as an indicator of organic brain damage. *Percept Mot Skills.* 1958;8:271-6.
 31. Kee BS. A preliminary study for the standardization of geriatric depression scale short form-Korea version. *J Korean Neuropsychiatr Assoc.* 1996;35:298-307.
 32. Bernstein PL, Friedmann E, Malaspina A. Animal-assisted therapy enhances resident social interaction and initiation in long-term care facilities. *Anthrozoos.* 2000;13:213-24.