

## ORIGINAL ARTICLE

# Effects of laughter therapy on depression, cognition and sleep among the community-dwelling elderly

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**Aim:** To investigate the effects of laughter therapy on depression, cognitive function, quality of life, and sleep of the elderly in a community.

**Methods:** Between July and September 2007, the total study sample consisted of 109 subjects aged over 65 divided into two groups; 48 subjects in the laughter therapy group and 61 subjects in the control group. The subjects in the laughter therapy group underwent laughter therapy four times over 1 month. We compared Geriatric Depression Scale (GDS), Mini-Mental State Examination (MMSE), Short-Form Health Survey-36 (SF-36), Insomnia Severity Index (ISI) and Pittsburgh Sleep Quality Index (PSQI) between the two groups before and after laughter therapy.

**Results:** There were no significant differences in baseline characteristics between the two groups. Before laughter therapy, the GDS scores were  $7.98 \pm 3.58$  and  $8.08 \pm 3.96$ ; the MMSE scores were  $23.81 \pm 3.90$  and  $22.74 \pm 4.00$ ; total scores of SF-36 were  $54.77 \pm 17.63$  and  $52.54 \pm 21.31$ ; the ISI scores were  $8.00 \pm 6.29$  and  $8.36 \pm 6.38$ ; the PSQI scores were  $6.98 \pm 3.41$  and  $7.38 \pm 3.70$  in laughter therapy group and control groups, respectively. After laughter therapy, the GDS scores were  $6.94 \pm 3.19$  ( $P = 0.027$ ) and  $8.43 \pm 3.44$  ( $P = 0.422$ ); the MMSE scores were  $24.63 \pm 3.53$  ( $P = 0.168$ ) and  $23.70 \pm 3.85$  ( $P = 0.068$ ); total scores of SF-36 were  $52.24 \pm 17.63$  ( $P = 0.347$ ) and  $50.32 \pm 19.66$  ( $P = 0.392$ ); the ISI scores were  $7.58 \pm 5.38$  ( $P = 0.327$ ) and  $9.31 \pm 6.35$  ( $P = 0.019$ ); the PSQI scores were  $6.04 \pm 2.35$  ( $P = 0.019$ ) and  $7.30 \pm 3.74$  ( $P = 0.847$ ) in both groups, respectively.

**Conclusion:** Laughter therapy is considered to be useful, cost-effective and easily-accessible intervention that has positive effects on depression, insomnia, and sleep quality in the elderly. *Geriatr Gerontol Int* 2011; 11: ●●-●●.

**Keywords:** cognitive function, depression, insomnia, laughter therapy, sleep quality.

## Introduction

The degenerative changes of biological and psychological functions of elderly people come with age. In Korea,

the population of those over 65 years was 9.1% in 2005<sup>1</sup> and diseases of the elderly became a central issue.

Depression is a common condition in the elderly that negatively affects numerous parts of their lives. The prevalence of depressive disorder among those over 65 years was 10.99% to 16.7% in Korea,<sup>2,3</sup> approximately 2.3% to 15.8% in the USA.<sup>4,5</sup> Recent studies have reported that untreated depression is related to the increase of illness and disability, suicide and mortality.<sup>6</sup> It also places a substantial burden on family caregivers as well as health and social services.

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The decline of cognitive functions is a primary symptom of dementia, one of the most important diseases afflicting elderly people. It begins with memory disturbances, miscalculations, disorientation and eventually results in a total loss of self-care and social functions. In Korea, the prevalence of dementia was 8.3% in the elderly over the age of 65 years in 2005, and it is predicted to increase up to 9.0% in 2020, according to the National Statistical Office. Dementia may accompany other psychiatric symptoms like depression, sleep disorder, personality changes, delusions and hallucinations. Because of these degenerative changes and chronic comorbidities, elderly people are at a higher risk of living a diminished quality of life.

So far, numerous researches on non-pharmacological treatments for those degenerative changes have been published. Among those non-pharmacological treatments, laughter therapy is a noticeable psychotherapeutic intervention for depression and dementia of the elderly. Takeda *et al.*<sup>7</sup> mentioned that laughter can be a good and effective complementary and alternative intervention in the treatment of dementia patients because laughter is preserved in dementia patients. Laughter therapy provides information on various ways of making humor. It is cost-effective and it does not need any special space nor special preparations. Freud (1905)<sup>8</sup> mentioned that humor can be seen as a specific defense mechanism, by which positive emotions can overcome the undesirable negative emotions involved in a stressful situation. One very early report by Paskind *et al.*<sup>9</sup> examined the impact of laughter upon muscle tone. It was demonstrated that intense laughter led to decreased skeletal muscle tone or relaxation of muscle groups. This report was the first research on the physiology of laughter. Since then, several studies concerning laughter in the treatment of patients who are suffering from psychiatric and physical diseases have been published; improving of quality of life in patients with depression or dementia,<sup>10</sup> decreasing stress and increasing natural killer cell activity<sup>11</sup> and acting as moderator of stress for depressive symptoms<sup>12</sup> as examples. However, most studies on laughter therapy are limited to disabled patients with psychiatric diseases or cancer; there is a lack of studies on community-dwelling elderly people in spite of the effects of laughter.

Therefore, the purpose of this study was to investigate the effects of laughter therapy on depression, cognitive function decline, sleep quality and quality of life for community-dwelling elderly people.

## Methods

### Subjects

Between July and September 2007, we recruited the study participants by free health consultation through

a community center in Daegu, South Korea. The eligibility criteria included: (i) age of 65 years or older; (ii) no history of admission within 1 month; and (iii) no involvement in other research studies. The total number of participants who agreed to the study and satisfied the inclusion criteria was 200 initially. We explained the purposes of this study and then interviewed participants to gain data from a questionnaire for 2 weeks. After the first interviews, the subjects were divided randomly into two groups of 100: 100 participants in the laughter therapy group and 100 participants in the control group. The subjects in the laughter therapy group underwent laughter therapy once a week, totally four times during 1 month; 1 month after its completion, they filled out the follow-up questionnaire with the help of research assistants. The 100 subjects in the control group did not receive any intervention and were shielded from laughter therapy; 2 months after the first interviews, they also filled out the follow-up questionnaire with the help of research assistants in the same week as the laughter therapy group.

The total study participants, who fulfilled the initial questionnaire sincerely, consisted of 83 subjects in the laughter therapy group and 91 in the control group. We excluded 35 subjects in the laughter therapy group, who had received laughter therapy less than three times or answered the questionnaire insincerely; and 30 subjects in the control group, who answered the follow-up questionnaire insincerely or were lost to follow up. Therefore, we analyzed 109 participants as final subjects, 48 in the laughter therapy group and 61 in the control group.

### Laughter therapy

Laughter therapy was performed by a nurse, who had been certified in laughter therapy by the Laughter-Therapy Professional Association, a private agency in Korea. The nurse planned the programs of laughter therapy, and carried out the programs with the participants in the laughter therapy group. The laughter therapy group received 1 h of laughter therapy once a week for 4 weeks. The participants in the laughter therapy group gathered in a community center while those participating in the blind study were contacted individually. During the programs, we restricted participation of other people to prevent the spread of intervention to the control group.

At the first meeting, the moderator explained the effects of laughter and showed a video of practical laughter therapy that the participants could understand easily. Then, the moderator directed them to relax their facial muscles, clap their hands, say hello to each other and laugh aloud clapping their hands. The meeting finished off with a laughter meditation session.

The subjects re-gathered after 1 week; the moderator made them laugh through dancing and singing. Then, the moderator led them in exercises training pelvic muscles with Kegel's exercise. They also watched the video of laughter therapy again and laughed aloud clapping their hands as with the last meeting. The second meeting finished off with singing a "trot" song and dancing.

The third meeting started with the singing of a song. The moderator taught them the effects of positive thinking and strategies on how to think positively; repeating positive words like good, happy, delightful, nice, and so on. As before, they watched the video of laughter therapy and then laughed aloud clapping their hands. The meeting finished off with a laughter meditation session like in the first meeting.

The fourth and final meeting also started with the singing of a song, and then they laughed while trying to pronounce "Ah-E-I-Oh-Woo" with a large gape. The moderator taught them how to express their own laughs; loquacious laughs, laughing with clapping, laughing like a lion, laughing like a balloon, laughing like a fine lady, and so on. They massaged each other's shoulders and said "I love you" to each other. They sang songs loudly while laughing and finished off the meeting with a laughter meditation session.

### ***Psychometric assessment instruments***

All questionnaires were examined by two researchers, who were expert doctors belonging to one university hospital. The researchers assessed the results of the psychometric assessment instruments.

For the evaluation of depressive moods, the 15-item Geriatric Depression Scale (GDS-15)<sup>13</sup> was used. The GDS is a 15-item questionnaire, scoring from 1–15. The higher the score in GDS, the more depressive tendencies subjects might have. The Korean version of the Mini-Mental State Examination (MMSE-K)<sup>14,15</sup> was used to evaluate the grade of cognitive impairment. Scores on the MMSE-K range 0–30, and scores lower than 23 indicate cognitive impairment. For functional evaluation, the Korean Activities of Daily Living (K-ADL) scale<sup>16</sup> ranging 7–21, and the Korean Instrumental Activities of Daily Living (K-IADL) scale,<sup>17</sup> ranging 10–32, were used, respectively. In principle, the lower the scores in K-ADL and K-IADL, the better biological function subjects have.

Health-related quality of life (HRQOL) was assessed by means of Medical Outcomes Research 36-item Short-Form Health Survey (SF-36), which has been certified as a valid and reliable means of measuring physical and mental health constructs.<sup>18</sup> The SF-36 survey consists of 36 questions integrating eight multi-item scales: 10 questions on physical function

(PF); two questions on social function (SF); four questions on role limitations caused by physical problems (RP); three questions on role limitations caused by emotional problems (RE); five questions on general mental health (MH); four questions on vitality, energy and fatigue (VT); two questions on bodily pain (BP); five questions on general health perceptions (GH); and one question about changes of health status. The scales and summary components ranged 0–100, with higher values denoting better function and fewer limitations.

The Insomnia Severity Index (ISI),<sup>19</sup> a brief instrument measuring insomnia, was used to evaluate perceived sleep difficulties. The ISI comprises seven items; each item is rated on a 0–4 scale and the total score ranges 0–28. A higher score suggests more severe insomnia. The Pittsburgh Sleep Quality Index (PSQI),<sup>20</sup> a self-rated questionnaire which assesses sleep quality and disturbances, was used. The PSQI consisted of seven components; each component is rated 0–3 and the sum of scores for these seven components range 0–21. A higher score suggests poorer sleep quality.

### ***Statistical analysis***

Statistical analyses were performed with SPSS ver. 14.0 for Windows. We used an independent Student's *t*-test and Pearson's  $\chi^2$ -test to compare each of the baseline characteristics between the laughter therapy group and control group. Paired-samples Student's *t*-test and ANCOVA were used to clarify the effects of laughter therapy in GDS and MMSE.  $P < 0.05$  was considered statistically significant.

## **Results**

### ***Sample characteristics***

The demographic characteristics are summarized in Table 1. Their mean ages were 76.33 in the laughter therapy group and 73.92 in the control group. In general terms, in the laughter and control groups, there was a high rate of women (79.2% and 70.5%, respectively), the majority of them had no formal education (66.7% and 55.7%, respectively), most of them were in a poor economic state (85.4% and 83.6%, respectively) and most had one or more physical diseases (95.8% and 91.8%, respectively). Including prior characteristics, there were no significant differences in other demographic characteristics between the two groups.

As shown in Table 2, there were also no significant differences in GDS, MMSE, ADL, IADL and SF-36 between the two groups before laughter therapy.

**Table 1** Baseline demographic data and clinical characteristics of the subjects

Variables	Laughter therapy group (n = 48)	Control group (n = 61)	P*
Age (years)	76.33 ± 6.44	73.92 ± 7.79	0.086
Sex			
Male	10 (20.8)	18 (29.5)	0.303
Female	38 (79.2)	43 (70.5)	
Educational status			
Illiteracy	32 (66.7)	34 (55.7)	0.246
Above Elementary	16 (33.3)	27 (44.3)	
Cohabitant			
Alone	25 (52.1)	24 (39.3)	0.184
Present	23 (47.9)	37 (60.7)	
Smoking			
Smoker	7 (14.6)	15 (24.6)	0.422
Ex-smoker	3 (6.3)	4 (6.6)	
Non-smoker	38 (79.2)	42 (68.9)	
Alcohol			
Regular	3 (6.3)	4 (6.6)	0.949
Under once/week	9 (18.8)	10 (16.4)	
None	36 (75.0)	47 (77.0)	
Regular exercise <sup>†</sup>			
Yes	15 (31.3)	12 (19.7)	0.165
No	33 (68.8)	49 (80.3)	
Economic status			
Fair	7 (14.6)	10 (16.4)	0.796
Poor	41 (85.4)	51 (83.6)	
Physical disease			
Absent	2 (4.2)	5 (8.2)	0.394
Present	46 (95.8)	56 (91.8)	
Bodyweight loss <sup>‡</sup>			
Absent	44 (91.7)	57 (93.4)	0.724
Present	4 (8.3)	4 (6.6)	
Religion			
Absent	8 (16.7)	12 (19.7)	0.687
Present	40 (83.3)	49 (80.3)	

\*Independent Student's *t*-test for continuous variables, and Pearson's  $\chi^2$ -test for discrete variables. <sup>†</sup>Regularly exercised for more than 30 min and more than three times a week. <sup>‡</sup>Unintended loss of bodyweight of more than 10% over 6 months. Data is presented as mean ± standard deviation or number (%).

### ***Effects of laughter therapy on depression and cognitive function***

Mean GDS score was significantly decreased from  $7.98 \pm 3.58$  to  $6.94 \pm 3.19$  in the laughter therapy group after laughter therapy ( $P = 0.027$ ). There was, on the contrary, no significant change of mean GDS scores in the control group before and after laughter therapy (from  $8.08 \pm 3.96$  to  $8.43 \pm 3.44$ ,  $P = 0.422$ ). ANCOVA, controlling for pre-experimental GDS scores and other variables, showed statistical significance in the effect of laughter therapy on GDS ( $P = 0.011$ ).

Mean MMSE scores were increased 0.81 in the laughter therapy group and 0.97 in the control group,

which were not significant in both groups. ANCOVA, controlling for pre-experimental MMSE scores and other variables, did not show statistical significance either ( $P = 0.071$ ; Table 3).

### ***Effects of laughter therapy on HRQOL***

Mean HRQOL scores were decreased 2.56 in the laughter therapy group and 2.22 in the control group, which were not significant ( $P = 0.347$  and  $P = 0.392$ , respectively). In the laughter therapy group, the MH, VT and GH scales were significantly increased (7.00, 8.85 and 6.50, respectively). In the control group, however, there were no significant differences in all HRQOL scales

**Table 2** Baseline psychometric test results of the subjects

Variables	Laughter therapy group (n = 48)	Control group (n = 61)	P*
GDS	7.98 ± 3.58	8.08 ± 3.96	0.889
MMSE	23.81 ± 3.90	22.74 ± 4.00	0.163
ADL	7.13 ± 0.39	7.36 ± 1.10	0.159
IADL	11.06 ± 2.02	12.11 ± 3.33	0.057
SF-36			
Mean	54.77 ± 17.63	52.54 ± 21.31	0.560
PF	47.81 ± 20.13	44.43 ± 28.00	0.482
SF	78.79 ± 22.87	70.92 ± 25.49	0.097
RP	51.56 ± 42.96	38.52 ± 43.44	0.121
RE	75.00 ± 41.55	76.49 ± 40.09	0.850
MH	58.92 ± 16.25	59.87 ± 19.83	0.788
VT	39.58 ± 19.29	38.44 ± 20.18	0.766
BP	54.04 ± 25.99	57.20 ± 26.53	0.535
GH	32.38 ± 20.39	33.61 ± 25.10	0.783

\*Pearson's  $\chi^2$ -test. All data is presented as mean ± standard deviation. ADL, activities of daily living; BP, body pain; GDS, Geriatric Depression Scale; GH, general health; IADL, instrumental activities of daily living; MH, mental health; MMSE, Mini-Mental State Examination; PF, physical function; RE, role limitations – emotional; RP, role limitations – physical; SF, social function; SF-36, 36-item Short Form health survey; VT, vitality.

**Table 3** Differences of mean values for depression and cognitive function between two groups after laughter therapy

	Pre-test	Post-test	P*	R <sup>2</sup>	P**
GDS					
Laughter therapy group	7.98 ± 3.58	6.94 ± 3.19	0.027	0.364	0.011
Control group	8.08 ± 3.96	8.43 ± 3.44	0.422		
MMSE					
Laughter therapy group	23.81 ± 3.90	24.63 ± 3.53	0.168	0.319	0.071
Control group	22.74 ± 4.00	23.70 ± 3.85	0.068		

\*Paired Student's *t*-test; \*\*ANCOVA adjusted for age, sex, educational status, cohabitation, smoking, alcohol, exercise, economic status, physical disease, pre-test GDS, and pre-test MMSE. All data is presented as mean ± standard deviation. GDS, Geriatric Depression Scale; MMSE, Mini-Mental State Examination.

before and after laughter therapy. ANCOVA, controlling for each of the HRQOL scales of pre-experiment and other variables, showed statistical significance in BP ( $P = 0.028$ ); whereas other factors did not show significance (Table 4).

### Effects of laughter therapy on sleep

The total ISI scores were decreased from  $8.00 \pm 6.29$  to  $7.58 \pm 5.38$  in the laughter therapy group ( $P = 0.327$ ) and increased from  $8.36 \pm 6.38$  to  $9.31 \pm 6.35$  in the control group ( $P = 0.019$ ) after laughter therapy. ANCOVA, controlling for pre-experimental ISI and other variables, showed statistical significance in the effect of laughter therapy on ISI ( $P = 0.015$ ).

The total PSQI scores were decreased from  $6.98 \pm 3.41$  to  $6.04 \pm 2.35$  in the laughter therapy group

( $P = 0.019$ ). In the control group, however, there was no significant change of total PSQI scores ( $P = 0.847$ ). ANCOVA showed statistical significance after controlling for pre-experimental PSQI scores and other variables ( $P = 0.047$ ; Table 5).

### Discussion

This study is a randomized, prospective, experimental research designed to determine the effects of laughter therapy on depression, cognition, sleep and quality of life among elderly people. Our study demonstrated that depression, insomnia and sleep quality improved in the laughter therapy group, while they worsened or showed no significant change in the control group.

**Table 4** Differences of mean values for health-related quality of life between two groups after laughter therapy

SF-36	Pre-test	Post-test	<i>P</i> *	<i>R</i> <sup>2</sup>	<i>P</i> **
Mean					
Laughter therapy group	54.77 ± 17.63	52.24 ± 20.89	0.347	0.257	0.728
Control group	52.54 ± 21.31	50.32 ± 19.66	0.392		
PF					
Laughter therapy group	47.81 ± 20.13	42.08 ± 25.11	0.136	0.250	0.381
Control group	44.43 ± 28.00	38.20 ± 27.46	0.058		
SF					
Laughter therapy group	78.79 ± 22.87	73.63 ± 24.97	0.201	0.059	0.940
Control group	70.92 ± 25.49	72.72 ± 24.94	0.673		
RP					
Laughter therapy group	51.56 ± 42.96	38.02 ± 45.54	0.089	0.145	0.728
Control group	38.52 ± 43.44	32.54 ± 40.80	0.265		
RE					
Laughter therapy group	75.00 ± 41.55	54.85 ± 49.82	0.006	0.097	0.270
Control group	76.49 ± 40.09	65.59 ± 45.13	0.123		
MH					
Laughter therapy group	58.92 ± 16.25	65.92 ± 21.29	0.020	0.150	0.227
Control group	59.87 ± 19.83	61.97 ± 21.27	0.455		
VT					
Laughter therapy group	39.58 ± 19.29	48.44 ± 26.68	0.017	0.169	0.146
Control group	38.44 ± 20.18	43.69 ± 21.95	0.065		
BP					
Laughter therapy group	54.04 ± 25.99	56.06 ± 17.86	0.550	0.168	0.028
Control group	57.20 ± 26.53	49.66 ± 23.31	0.050		
GH					
Laughter therapy group	32.38 ± 20.39	38.88 ± 21.60	0.042	0.153	0.836
Control group	33.61 ± 25.10	37.18 ± 20.83	0.247		

\*Paired Student's *t*-test; \*\*ANCOVA adjusted for age, sex, educational status, cohabitation, smoking, alcohol, exercise, economic status, physical disease, pre-test geriatric depression scale, pre-test Mini-Mental State Examination, and each pre-test SF-36 scales. All data is presented as mean ± standard deviation. BP, body pain; GH, general health; MH, mental health; PF, physical function; RE, role limitations – emotional; RP, role limitations – physical; SF, social function; SF-36, 36-item Short Form health survey; VT, vitality.

**Table 5** Differences of insomnia severity index and sleep quality between two groups after laughter therapy

	Pre-test	Post-test	<i>P</i> *	<i>R</i> <sup>2</sup>	<i>P</i> **
ISI					
Laughter therapy group	8.00 ± 6.29	7.58 ± 5.38	0.327	0.775	0.015
Control group	8.36 ± 6.38	9.31 ± 6.35	0.019		
PSQI					
Laughter therapy group	6.98 ± 3.41	6.04 ± 2.35	0.019	0.403	0.047
Control group	7.38 ± 3.70	7.30 ± 3.74	0.847		

\*Paired Student's *t*-test; \*\*ANCOVA adjusted for age, sex, educational status, cohabitation, smoking, alcohol, exercise, economic status, physical disease, pre-test geriatric depression scale, pre-test Mini-Mental State Examination; and pre-test ISI for ISI, pre-test PSQI for PSQI. All data is presented as mean ± standard deviation. ISI, Insomnia Severity Index; PSQI, Pittsburgh Sleep Quality Index.

The results of depression in this study are similar to previous studies that demonstrated that a sense of humor is correlated with increased self-esteem and decreased depressive features.<sup>12,21</sup> Though laughter

therapy had a positive effect on depression and sleep, it is unclear whether improvement of depression led to improvement of sleep or laughter therapy influenced depression and sleep independently. In our study, being

incompletely blind to laughter therapy for the control group, may have had an influence on low compliance and high complaints with the study. It may have led to slight increases of the depression scale in the control group. Moreover, we did not exclude positive effects of the group meeting themselves; thus, the effects of group meeting may have contributed to the improvement of depression in the laughter therapy group.

In general, scores higher than or equal to 6 in GDS are used to judge whether depressive symptoms are present.<sup>22</sup> In this study, mean GDS score were 7.98 and 8.08 in both groups, respectively, which showed high tendencies of depression. Considering the factors influencing geriatric depression,<sup>2,3,23</sup> a high rate of women, poor economic state, single living and the presence of comorbidities may influence high GDS scores. The subjects also showed ISI scores above 8,<sup>19</sup> sub-threshold insomnia and PSQI scores above 6,<sup>20</sup> each of which indicate poor sleep quality. It is possible to say that there must be a correlation between depression and insomnia, based on the results of research work. Insomnia is a major risk factor of depression in the elderly,<sup>24</sup> and depressive mood is associated with development of insomnia symptoms.<sup>25</sup>

The MMSE scores were similarly increased in both groups after laughter therapy, which was not statistically significant. These results are considered to have been influenced by two factors: simplification of the follow up questionnaire and the same items of MMSE that they had already done during the first investigation made them easier to answer the second time. When using MMSE-K, the threshold of 23 points or less is generally used to indicate cognitive impairment,<sup>15</sup> mean scores were 23.81 and 22.74 in both groups, respectively, which demonstrated mild cognitive impairment. In this study, there were multiple factors which related to cognitive impairment;<sup>2,26,27</sup> the subjects were relatively advanced in age, there was a high rate of women, a majority of them had no formal education and most of them were of poor socioeconomic status. In addition, the fact that there is a strong relation between cognitive function and depression<sup>28,29</sup> could explain how high tendencies of depression might influence low cognitive function of the subjects.

Our study did not demonstrate significant changes of HRQOL in both groups after laughter therapy except BP. The BP scores were increased in the laughter therapy group and decreased in the control group. This might suggest that the use of laughter diminishes pain and moderates a patient's response to pain.<sup>30</sup> The study by Walter *et al.*<sup>10</sup> showed significant improvement of quality of life in patients with late-life depression after humor therapy; the study was of inpatients with major depressive disorders using the Anamnestic Comparative Self Assessment Scale (ACSA) to measure quality of life. On the other hand,

our study was of community-dwelling people using SF-36 to measure quality of life. These differences are considered to have influenced the contrary results between the studies.

In general, mean HRQOL scores tend to be low before and after laughter therapy in our study. Considering the results of recent studies,<sup>31,32</sup> relatively older age, low socioeconomic status, high depression scores and presence of comorbid chronic illness may have influenced the low HRQOL in this study. According to Tsai *et al.*,<sup>33</sup> HRQOL is a predictor of mortality among the community-dwelling elderly; thus, we must be concerned about the high rate of elderly people in Korea.

We investigated the hypothesis that laughter therapy may affect depression, cognitive function, sleep and quality of life of community-dwelling elderly people. Our study demonstrated that laughter therapy had positive effects on geriatric depression, insomnia and sleep quality, but no significant effects on cognitive function and HRQOL. There are several limitations of these results. The sample size was relatively small; initial subjects were 200 but 52 in the laughter therapy group and 39 in the control group were excluded, and the high ratio of dropout is a significant limitation. There could be selection bias because the subjects were all of lower socioeconomic status, advanced age and their residency was limited to one city. Incomplete blinding for the control group may have influenced the results. We did not exclude positive effects of the group meetings themselves that might have had some affect on the depression scale. Also, the laughter therapy was performed for only 1 month, limiting to generalized results. From now on, further studies are needed that control these limitations and follow up more frequently as well as for a long-term period.

Laughter therapy provides various methods of and information on humor, is of low cost, and it can be easily performed without regard of place and time; therefore, it is a very effective and practical intervention. Further studies with higher frequency, long-term laughter therapy and larger samples may provide better results in the understanding of therapeutic advantages of laughter therapy in the treatment and prevention of depression and cognitive function decline of the elderly.

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