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# The Use of Aroma-acupoint Therapy and Aromatherapy to Treat Depression in Dementia Patients with Severe Cognitive Impairment

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## Abstract

**Background:** Depression, one of the most common b*ehavioral and psychological symptoms of dementia in seniors*, adversely affects life quality of both patients and caregivers. Because many antipsychotic drugs can cause severe side effects in patients with dementia, there is a need for effective noninvasive treatments for depression in these patients. This study compared the effect of aroma-acupoint therapy and aromatherapy on depression in DSM-IV diagnosed senior dementia patients with Mini-Mental State Examination (MMSE)-assessed severe cognitive impairment living in long-term care facilities.

**Methods:** Participants were randomly assigned to one of three groups: aroma-acupoint therapy (n=56), aromatherapy (n=73), and control (n=57). Outcomes were measured using the Cornell Scale for Depression in Dementia (CSDD) for changes in depressive mood and MMSE for changes in cognitive status in pre-test, post-test, and post-three-week test, and blood pressure and pulse rate, physical indicators of stress, measured daily during the four-week intervention.

**Results:** The aroma-acupoint therapy and aromatherapy groups were found to have significant improvement in depressive mood in the post-test and post-three-week test, but no significant change in cognitive function. During the four-week intervention period, the two study groups also had significant weekly improvements in blood pressure and pulse rate.

**Conclusion:** Aroma-acupoint therapy and aromatherapy can effectively improve depression as well as the physical indicators of relaxation, blood pressure and pulse rate, but not cognitive status in seniors with dementia and severe cognitive impairment. Future studies with larger populations are needed further develop optimal regimens using aroma-acupoint therapy and aromatherapy to treat depression in this population.

**Keywords:** Aroma-acupoint therapy; Depression; Dementia; Aromatherapy

## Introduction

Depression is regularly found in senior citizens who have been reported in Taiwan to have a prevalence rate of 35.2% [1]. Senile depression is often accompanied by low mood, sleep disorder, and agitation, and those with severe symptoms may also attempt suicide [2]. It is often neglected clinically and its symptoms like sleep disturbance are commonly considered a natural sign of aging by family members or caregivers. Senile depression is highly related to deterioration in physical functioning sometime caused by cardiac diseases, head injuries, or fractures and also related to psychosocial factors such as living alone and decreased cognitive function [3]. The decreased cognitive function associated with dementia not only easily leads to depression in some seniors but it also makes it very difficult for them to express their symptoms verbally. As a result, depression in senior dementia patients is easily neglected and often requires psychological assessment to identify. Prado-Jean et al. using the Cornell Scale for Depression in Dementia (CSDD) to interview 319 dementia patients and their caregivers, found 42.9% of these patients had the symptoms of depression and 75.9% had behavioral and psychological symptoms of dementia (BPSD) [4]. The most common symptom of the BPSD is depression, followed by restlessness, aggressive behavior, and anxiety. Physiologically, the sympathetic nerves are stimulated, and adrenaline will be released from the adrenal medulla, increasing HR, BP, and respiration [5]. Patients with these symptoms are often sent to long-term care facilities. Often, caregivers at these facilities, where the prevalence rate of BPSD is known to be higher, are not well prepared to manage BPSD and find the workload stressful [6-8].

Currently, antidepressants remain the mainstay for treatment of senile depression. The frequent use of Selective Serotonin Reuptake Inhibitor (SSRI) may increase the occurrence rate of side effects. Because serotonin syndrome and serotonin discontinuation syndrome may contribute to agitation, restlessness, or a change in consciousness, the Canadian Consensus Conference on Dementia (3rd CCCDTD) has suggested using antidepressants only after non-pharmacological interventions have not been found to be effective [9].

Non-pharmacological interventions for depression include exercise programs, acupuncture, music therapy, and aromatherapy [10-13]. Aromatherapy has been reported to improve low mood, activate the parasympathetic nervous system, lower heartbeat, inhibit the sympathetic system, and alleviate tension [12]. According to a systematic review by Yim, Ng, Hector, Tsang and Leung, aromatherapy can alleviate depression and improve such physical parameters as blood pressure and heart rate [14]. They reviewed six studies, three of which were not randomized controlled trials and number of subjects ranged from five to eight only. Two of the randomized controlled trials they reviewed performed repeated measures at baseline, at Week 6, and at Week 10. In one of the studies, the depression and anxiety of the experimental group (aromatherapy massage) and the control group (usual care) were significantly improved at Week 6, but there was no difference at Week 10. In the other one, the control group (massage group) was found to have greater improvement in depression than the aromatherapy massage group at post-1-week test. In all six studies, essential oil was applied whenever massage was practiced, making aroma-massage the major technique they studied.

Acupuncture is another well-known non-pharmacological means of treatment. In rats with vascular dementia, acupuncture was found to significantly increase the number of pyramidal neurons in the hippocampus and improve cognitive deficits. It is also reported to activate central nervous system's neurotransmitters, such as serotonin, which reduces oxidative damage, enhances blood flow in the brain, increases quality of sleep, and improves depression [15]. Zuppa et al. conducting a 5-week study investigating the effect on acupuncture on poor sleep in 48 older patients, found improvements in relaxation response, sleep quality, and depression symptoms [13]. Acupressure, the application of pressure to acupuncture points, is thought to function similarly to acupuncture. It might be of interest to investigate the combined use of aromatherapy and this special time of massage and its effect on depression.

In this study, we compare the effects of aroma acupoint therapy and aromatherapy on depression symptoms in senior patients with dementia and severe cognitive impairment. The findings of this study may help determine whether this easy to apply non-pharmacological intervention might be used by caregivers when caring for their patients.

## Materials and Methods

### Participants

For this experimental study, we recruited participants from six dementia care units in different institutions (3 veterans' homes and 3 long-term care facilities) in Taiwan. Residents in each of the two types of facilities were randomly assigned to be one of three groups, either an aroma-acupoint, aromatherapy, and control group, making six groups in total. All recruitment and intervention occurred from February 1, 2012 to May 31, 2013. To be included, each participant had to: (i) be diagnosed with dementia following DSM-IV criteria, (ii) be assessed as having severe cognitive impairment defined as having a Mini-Mental State Examination (MMSE) score under 16, (iii) be residing in one of the six long-term care facilities during the study; and (iv) have no skin tears or infections around the acupoints.

Using G-power 3.0 to calculate the sample size, we determine that we needed 108 subjects. When $\alpha$=0.05 and the effect size was 0.25, we would achieve a statistical power of 80%.

During recruitment, the purpose and the protocol of this study were explained to facility administrators who helped us obtain the consent of the participants or their family members. Each participant or guardian provided informed written consent. The protocol for this study was approved by the IRB of Taipei City Hospital.

Interventions

Five common acupoints were chosen based on those used by previous studies on the use of acupuncture to treat depression. It is thought that treatment of these acupoints can help pacify patients and stabilize their emotions. Chinese medicine experts were requested to review the aroma acupoint protocol, including the selection of acupoints and the duration of the applying pressure to the acupoints. As can be seen in Figures 1-3, the acupoints we treated were the Baihui (GV 20), Fengchi (GB 20), Shenmen (HT 7), Neiguan (PC 6), and Sanyinjiao (SP 6) [16-19]. Aroma acupoint protocol involved (i) use of a 2.5% lavender oil applied to each acupoint which would be pressed for 2 minutes and (ii) a five-minute warm-up massage. The therapy was performed in patients once a day five days a week for four weeks no longer than 15 minutes per session. In the aromatherapy group, 2.5% lavender oil was applied at the same acupoints and left there for the same length of time as it was for the aroma acupoint therapy group. The control group received their usual daily care without either of the two interventions.

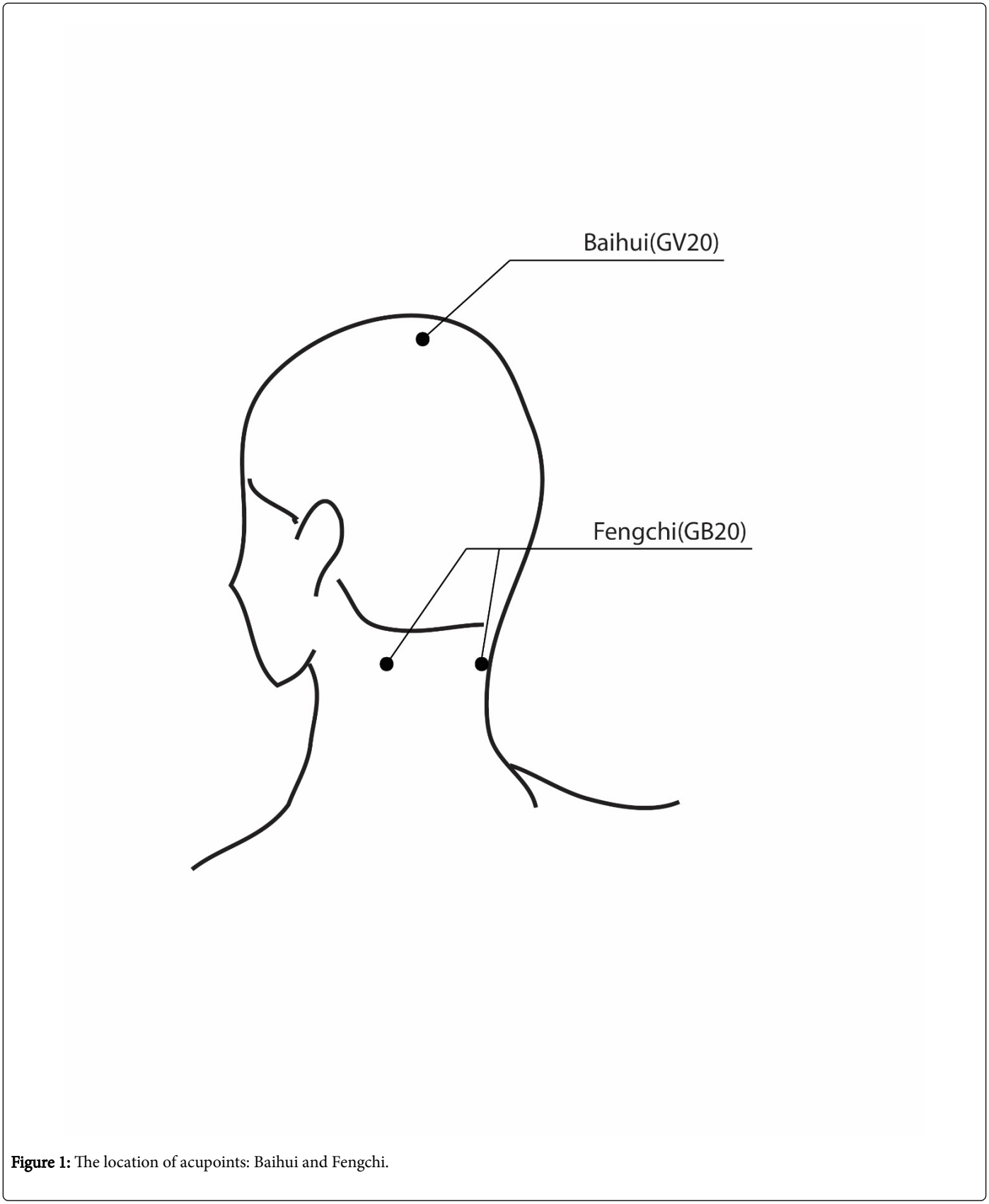


**Figure 1:** The location of acupoints: Baihui and Fengchi.

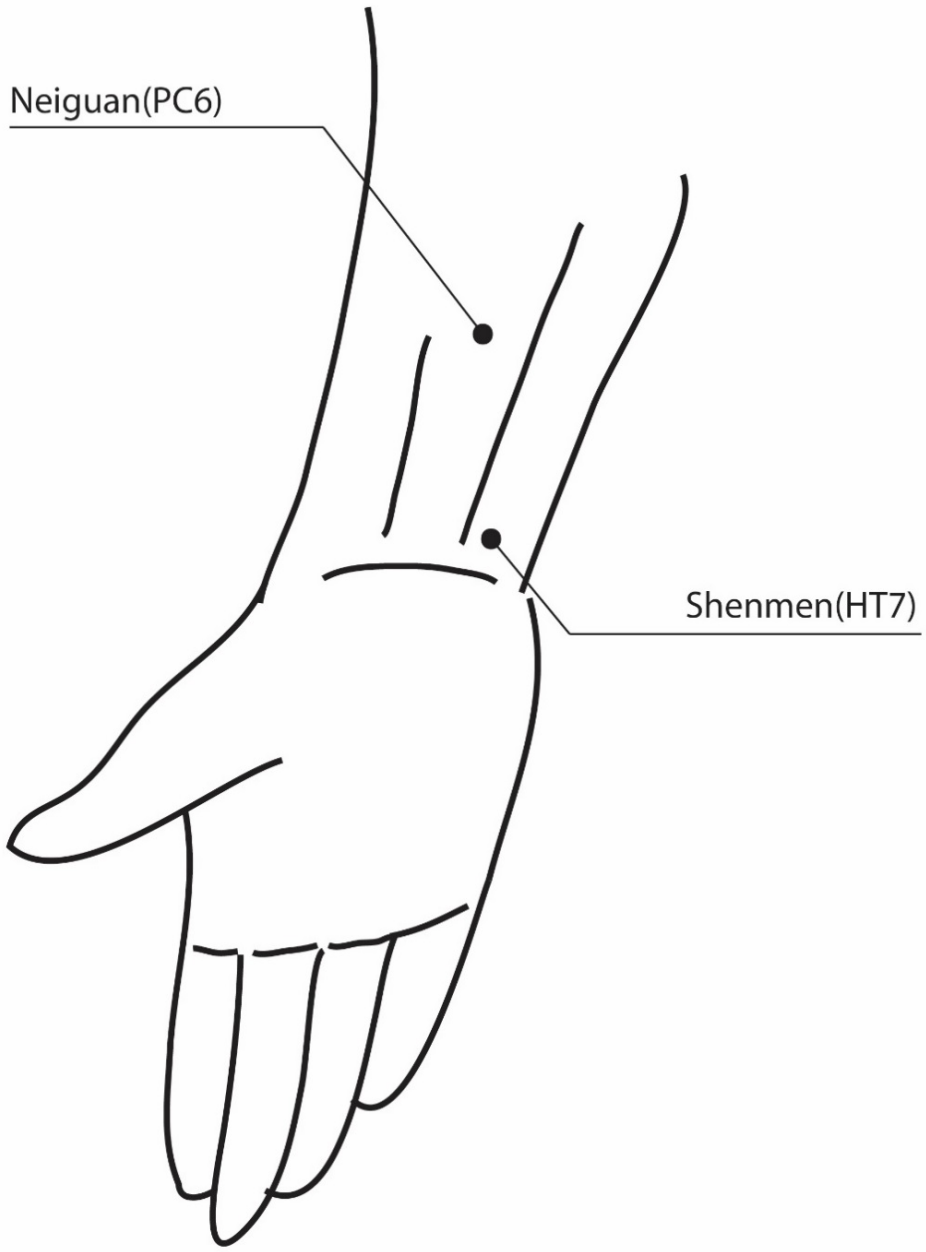


**Figure 2:** The location of acupoints: Neiguan and Shenmen.

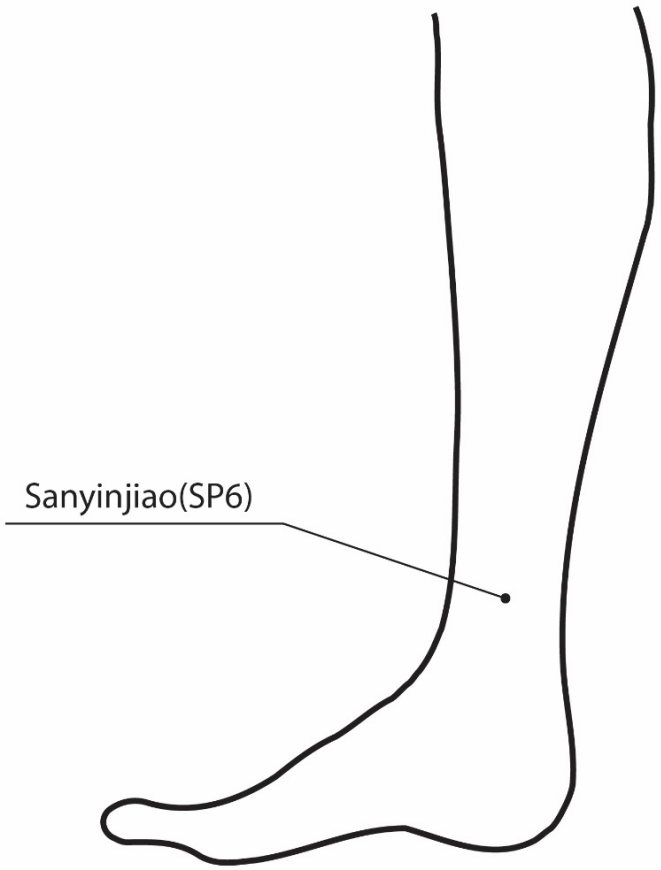


**Figure 3:** The location of acupoint: Sanyinjiao.

## Instruments

To assess depression, we used the Cornell Scale for Depression in Dementia Chinese Version (CSDD-C), originally developed by Alexopoulos, Abrams, Young and Shamoian [20]. The CSDD is used to evaluate depression in seniors with cognitive dysfunction. The tool's 19 item covers five areas: mood-related signs, physical signs, behavioral disturbance, cyclic functioning, and ideational disturbances, 0 for none, 1 for mild, and 2 for severe. A total score less than 6 points is considered normal. The higher the score, the more severe the depression. Lin and Wang established the reliability and validity of CSDD-C, and five experts previously evaluated its content [21]. In that study which included 145 elderly dementia patients in long-term care facilities in southern Taiwan, the Content Validity Index (CVI) was 0.92 and, Kappa showed an inter-rater agreement of 0.43–0.89. The Cronbach's α for internal consistency reliability was 0.84. Thus, the questionnaire has been found to be a stable and reliable tool for the assessment of senior Chinese-speaking patients with dementia patients. Professor Wang of the previous study authorized the use of CSDD-C for current study.

MMSE, introduced by Folstein et al. in 1975, has been a commonly used tool for assessing cognitive function for clinical and research purposes [22]. It was translated into Chinese by Guo et al. and has been approved by National Health Insurance Administration as a major standard when prescribing medications for Alzheimer's disease [23]. The MMSE covers time and location orientation, immediate memory, short-term memory, attention, arithmetic ability, language ability, and visual graphic ability. The highest score is 30, the higher the score, the better the cognitive function. A total score less than 24 points indicates mild cognitive dysfunction and a score less than 16 severe cognitive dysfunctions.

Each participant's blood pressure and pulse rate were recorded every day before and after the intervention for four weeks to evaluate the changes in these vital signs.

## Study Procedure

The CSDD-C and MMSE were administered by a research assistant three times in all three groups: pre-test, post-test, and post-three-week test. Blood pressure and heart rate were taken before and after each intervention session for four weeks.

## Statistical Analysis

Patient characteristics were analyzed descriptively. Differences between the three groups were compared using one-way ANOVA and chi-square tests. A generalized estimating equation (GEE) for repeated measurements was used to assess depression and cognition. Based on intention-to-treat analysis, subjects with incomplete data were included in the GEE analysis using the missing-at-random assumption. All statistical operations were performed using Statistical Product and Service Solutions (SPSS) 20.0 (IBM Corporation, Armonk, NY, USA).

## Results

A total of 276 qualified participants were identified from the six institutions. Twenty-one participants were hospitalized during the study, one participant died, and 68 participants decided not to participate in the study, leaving 186 participants in six institutions to randomly assign to one of three groups. As can be seen Table 1, a summary of participant characteristics, the mean age was 85.3 in the aroma-acupoint group, 83.67 in the aromatherapy group, and 81.56 in the control group, with significant differences in age between the groups. There were no significant gender differences among the groups. AD was the most common type of dementia. Two types of restraints were being used: a physical restraint consisting of restrictive strap and a medical restraint involving the use of antipsychotic drugs. There were no significant differences in the type of restraints used.

| | Aroma-acupoint group (n=56) | Aroma Group (n=73) | Control group (n=57) | Fa/χ2b | P |
|---|---|---|---|---|---|
| **Age, mean ± SD ,n(%)** | 85.3 ± 5.76 | 83.67 ± 4.96 | 81.56 ± 6.79 | 5.91a/ 20.83b | 0.00*/ 0.00* |
| **65-74yrs** | 4(7.1%) | 3(4.1%) | 11(19.3%) | | |
| **75-84yrs** | 14(25%) | 39(53.4%) | 25(43.9%) | | |
| **≥85yrs** | 38(67.9%) | 31(42.5%) | 21(36.8%) | | |
| **Sex, n(%)** | | | | 5.69b | 0.06 |
| **Male** | 46(82.1%) | 48(65.8%) | 43(75.4%) | | |
| **Female** | 10(17.9%) | 25(34.2%) | 14(24.6%) | | |
| **Diagnosis of Dementia,n(%)** | | | | 20.40b | 0.00* |
| **AD** | 45(80.3%) | 70(95.9%) | 55(96.5%) | | |
| **Vascular** | 10(17.9%) | 0(0%) | 2(3.5%) | | |
| **Others** | 1(1.8%) | 3(4.1%) | 0(0%) | | |
| **Restraint, n(%)** | | | | 5.67b | 0.23 |
| **None** | 29(51.8%) | 35(47.9%) | 31(54.4%) | | |

| | | | | | |
|---|---|---|---|---|---|
| **One(chemical/physica)** | 22(39.2%) | 35(47.9%) | 25(43.9%) | | |
| **Both** | 5(9%) | 3(4.2%) | 1(1.7%) | | |

**Table 1:** Participant characteristics. Note aone-way ANOVA; bchi-squared test; * p<0.05.

Table 2, a summary of CSDD-C scores, shows both the aroma-acupoint group and the aromatherapy group had significantly CSDD-C higher average pre- and post-test scores than the control group. Compared to pre-test, the aroma-acupoint group and the aromatherapy group had significantly lower in the post-test and post-3-weeks test, indicating that depression had improved in the two groups. The post-test scores of the two groups were lower than they were in the post-3-week test, suggesting immediate improvement in depression. The post-3-week test, however, revealed reduced improvement.

In Table 3, the means of MMSE of the three groups in the pre-test, post-test, and post-3-weeks test were shown to be significantly lower than 16 points, suggesting that the cognitive dysfunction of all three groups was extremely severe. There was no difference in cognitive status among the three groups. We also found no significant differences change in cognitive functioning in the three groups over time, when comparing their pre-test, post-test, or post-three-weeks test. As for cognitive function, the comparison of the pre-test and post-test revealed that neither aroma acupoint therapy nor aromatherapy had an effect on cognitive functioning.

Table 4 shows average weekly changes in blood pressure and pulse rates in the three groups during the interventions. Based on our one-way ANOVA, before and after intervention blood pressures, both systolic and diastolic, and pulse rates were significantly lower in the aroma acupoint therapy group and the aromatherapy group than in the control group each week.

| | **Aroma-Acupoint group** | **Aroma-group** | **Control group** | **p** |
|---|---|---|---|---|
| **Group, β(95%CI)** | 1.98(1.26-2.71) | 1.07(.39 -1.75) | 0(reference) | 0.00*a/.00*b |
| **Time** | | | | |
| **Pre-test, mean ± SD** | 9.02 ± 2.94 | 8.14 ± 1.68 | 7.19 ± 1.48 | |
| **Post-test, mean ± SD** | 8.20 ± 1.98 | 7.04 ± 1.16 | 8.63 ± 2.78 | 0.00*c |
| **Post 3 weeks, mean ± SD** | 8.16 ± 2.24 | 7.84 ± 1.57 | 8.12 ± 1.66 | 0.00*d |
| **Time×group** | | | | |
| **Post-test*group,β(95%CI)** | -2.25(-3.08 to -1.42) | -1.78(-2.62 to -0.93) | 0(reference) | 0.00*e/0.00*f |
| **Post 3 weeks*group,β(95%CI)** | -2.52(-3.30 to -1.74) | -1.19(-1.97 to -0.40) | 0(reference) | 0.00*g/0.00*h |

**Table 2:** Pre-, post- and post-three-week CSDD-C scores. Note: a. aroma-acupoint therapy group vs. control group; b. aromatherapy group vs. control group; c. post-test vs. pre-test; d. post-3-week vs. pre-test; e. post-test vs. pre-test in aroma-acupoint therapy group; f. post-test vs. pre-test in aromatherapy group; g. post-3-week vs. pre-test in aroma-acupoint therapy group; h. post-3-week vs. pretest in aromatherapy group. * p<.05

| | **Aroma-Acupoint group** | **Aroma-group** | **Control group** | **p** |
|---|---|---|---|---|
| **Group, β(95%CI)** | 2.02(-0.52-4.56) | 0.88(-1.49-3.24) | 0(reference) | 0.12a/0.47b |
| **Time** | | | | |
| **Pre-test, mean ± SD** | 7.67 ± 6.36 | 6.54 ± 6.34 | 5.94 ± 7.03 | |
| **Post-test, mean ± SD** | 8.42 ± 7.09 | 7.47 ± 6.66 | 6.39 ± 7.25 | 0.18c |
| **Post 3 weeks, mean ± SD** | 7.96 ± 6.39 | 6.09 ± 6.14 | 6.37 ± 7.47 | 0.31d |
| **Time×group** | | | | |
| **Post-test*group,β(95%CI)** | 0.41(-.49-1.30) | -0.13(-1.31-.77) | 0(reference) | 0.38e/0.77f |
| **Post 3 weeks*group,β(95%CI)** | 0.33(-.53-1.19) | -0.52(-1.36-0.33) | 0(reference) | 0.45g/0.23h |

**Table 3:** Pre-, post- and post-three-week MMSE scores. Note: a. aroma-acupoint therapy group vs. control group; b. aromatherapy group vs. control group; c. post-test vs. pre-test; d. post-3-week vs. pre-test; e. post-test vs. pre-test in aroma-acupoint therapy group; f. post-test vs. pre-test in aromatherapy group; g. post-3-week vs. pre-test in aroma-acupoint therapy group; h. post-3-week vs. pretest in aromatherapy group. * p<0.05.

| | Mean | | | SD | | | F |
|---|---|---|---|---|---|---|---|
| | Aroma-acupoint | Aroma | Control | Aroma-acupoint | Aroma | Control | |
| **Average Systolic pressure differences** | | | | | | | |
| 1st week | -8.10 | -0.88 | 0.28 | 5.69 | 7.14 | 6.60 | 28.09** |
| 2nd week | -10.08 | -3.29 | 1.51 | 5.32 | 8.01 | 6.31 | 44.27** |
| 3rd week | -10.91 | -3.95 | 1.14 | 6.63 | 7.29 | 6.64 | 46.25** |
| 4th week | -4.44 | -1.67 | 0.88 | 3.29 | 5.16 | 5.05 | 19.17** |
| **Average diastolic blood pressure differences** | | | | | | | |
| 1st week | -4.74 | -1.61 | 1.33 | 4.54 | 3.96 | 4.63 | 28.55** |
| 2nd week | -5.02 | -2.17 | 0.77 | 3.91 | 4.63 | 5.49 | 22.37** |
| 3rd week | -5.64 | -1.97 | 0.39 | 3.73 | 4.41 | 4.28 | 31.67** |
| 4th week | -4.44 | -1.67 | 0.88 | 3.29 | 5.16 | 5.05 | 19.17** |
| **Average pulse rate differences** | | | | | | | |
| 1st week | -3.59 | -1.36 | 2.29 | 2.50 | 4.27 | 3.98 | 37.82** |
| 2nd week | -3.90 | -1.89 | 2.58 | 2.46 | 3.49 | 3.80 | 61.09** |
| 3rd week | -3.72 | -1.27 | 2.45 | 2.72 | 3.90 | 3.34 | 51.16** |
| 4th week | -3.49 | -2.14 | 1.78 | 2.80 | 4.73 | 4.04 | 28.06** |

**Table 4:** Comparisons of average blood pressure and heart rate during intervention. Note $^{**}p<0.01$.

## Discussion

This experimental investigation found both aroma-acupoint therapy and aromatherapy to have a significant effect on reducing depression and improving physiologic indicators, but not on cognitive functioning, in the participants seniors with dementia and severe cognitive impairment in this study.

Our finding of significant improvement in depression was consistent with those previous studies of the effect of acupuncture/aromatherapy on depression [13,14]. The participants with severe dementia in our study had lower CSDD scores in general than other other studies incidence of depression. People in the early and middle stages of dementia are well known to have high rates of depression and anxiety. Depression in early dementia is an emotional reaction to perceived cognitive loss. Severe dementia and depression both commonly produce symptoms such as hypersomnia, fatigue and weight loss, so it is difficult to distinguish which of the two cause these symptoms in one patient. One psychiatrist's study in Taiwan found a lower incidence of depression in his patients with severe dementia [24,25]. Future studies are needed to clarify whether this difference incidence of depression is caused by severe cognitive impairment, speech retardation, or behavioral problems.

Our participants both the aroma acupoint therapy and aromatherapy groups had significant improvement in the physiologic indicators of depression. Blood pressure and pulse rate in both groups significantly declined during the 4-week intervention period, suggesting elevation of parasympathetic activities and physical relaxation. When the sympathetic nervous system was inhibited, blood pressure declines and heart rate slows, proving that both the aroma acupoint therapy and aromatherapy groups experienced had benefited from some adjustment of the autonomic nervous system.

No significant group, time, and group-time interaction differences in cognitive status were found in the three groups, indicating that neither aroma-acupoint therapy nor aromatherapy could improve the cognitive function in our patients with dementia patients, a finding consistent with that of Zuppa et al. [13]. Recently, aromatherapy has been gradually introduced the treatment of dementia patients. In most studies, it is used to reduce agitation and improve life quality not to try to improved depression or cognitive functioning [26,27].

This study has some limitations. One is that epidemiological studies of dementia show there are more women with Alzheimer's disease (AD) than men [1]. Our study recruited more male AD patients because three of the six institutions from which we recruited participants were retirement homes for veterans. Another limitation is that this was a single-blind study, meaning the participants were aware of which group they had been assigned to. In future studies, the participants of the control group can have placebo oil applied or be pressed at fake acupoints in order to create a stricter double-blind experiment.

## Conclusion

This experimental study assessing the effect of Complementary and Alternative Medicine (CAM) on depression in patients with dementia fond that both aroma-acupoint

therapy and aromatherapy had significant improvement in depression as assessed by CSDD-C and blood pressure and heart rate during the period of intervention. Aroma acupoint therapy was better able to inhibit the sympathetic nervous system and activity of the parasympathetic nervous system compared with aromatherapy alone. Our findings support the efficacy of this non-pharmacological treatment in improving depression. These non-pharmacological protocols should be more fully explored and refined in future studies.

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