The Psychologic Consequences of Chronic Dyspnea in Chronic Pulmonary Obstruction Disease: The Effects of Acupressure on Depression

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ABSTRACT

Objectives: The onset of depression is often triggered by breathlessness in persons with chronic obstructive pulmonary disease (COPD). It is hypothesized that these are the psychologic consequences of chronic dyspnea. Lessening dyspnea might alleviate depressive symptoms. Acupressure has been shown in other studies to produce relaxation. The aim of this study was to determine if it would lessen dyspnea and reduce depression in patients with COPD.

Subjects and Design: Subjects diagnosed with COPD were chosen from one medical center and three regional hospitals in Taipei, Taiwan. A randomized, block experimental design was used, with subjects and the data collector blinded. Using age, gender, pulmonary function, smoking, and steroid use as matching factors, 44 subjects were randomly assigned to either the true acupressure or the sham acupressure groups. The true acupressure group received a program of acupressure using appropriate acupoints that promote relaxation and relieve dyspnea. The sham acupressure group received acupressure using sham acupoints different from the meridians and ganglionic sections of the true acupressure group. Both acupressure programs lasted 4 weeks, with five sessions per week that lasted 16 minutes per session.

Outcome Measures: The Geriatric Depression Scale (GDS) and Dyspnea Visual Analogue Scale (DVAS) were administered prior to the program as a baseline, and again following the completion of the 4-week program. Oxygen saturation and other physiological indicators were measured before and after each session.

Results: The results of this study showed that the GDS scores, DVAS scores, oxygen saturation, and physiological indicators of the true acupressure group were significantly improved, compared to those of the sham acupressure group.

Conclusions: These findings provide health professionals with an evidence-based intervention to use with persons with COPD. Applying this acupressure program in clinical practice, communities, and long-term care units may lessen chronic dyspnea and depression in persons with COPD.

INTRODUCTION

In 2003, 126,000 people died from chronic obstructive pulmonary disease (COPD), which ranks as the fourth-leading cause of death in the United States.[1] In Taiwan, COPD was the eleventh-leading cause of mortality in 2004.[2] It was projected that COPD would be the world's fifth-ranking cause of burden of disease by 2020.[3] COPD is characterized

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by a slowly progressive irreversible airflow limitation caused by chronic bronchitis, or emphysema with related symptoms, such as exertion dyspnea, chronic cough, expectoration, and wheezing.[4] Most COPD patients have been found to meet the diagnostic criteria for dysthymia, characterized by a chronic depression or irritable mood for at least 2 years.[5] In a previous report, Yohannes et al. indicated that 42% of the 137 subjects with COPD in their study were identified as being clinically depressed.[6] In Taiwan, Tsai reported that the prevalence of depressive symptoms was 40% among 230 COPD outpatients.[7] Depressive symptoms are so common in COPD patients that it is often accepted as a manifestation of the disease and rarely assessed or treated as an addressable condition.

Chavannes et al. found that dyspnea was independently associated with depressive symptoms in mild to moderate COPD patients.[8] Hypoxia is known to induce not only psychomotor slowing and memory impairment, but also depressed moods.[9] Depressive symptoms have been categorized as one of the psychologic consequences of dyspnea.[10] Depression with primary symptoms such as poor appetite or overeating, insomnia or hypersomnia, low energy, loss of self-esteem, poor concentration, and feelings of hopelessness can impair a patient's quality of life and increase their dependency on others.[5,11] COPD patients with depressive symptoms have been reported to have significantly more impaired function and worse health status than those without depressive symptoms.[12] Hence, treatment of respiratory symptoms will often produce a significant improvement in depressive symptoms.

In clinical practice, Ries et al. used a pulmonary rehabilitation program consisting of twelve 4-hour sessions that produced no significant reduction in depressive symptoms for 119 COPD outpatients.[13] Withers et al. enrolled 95 severe COPD outpatients into six 3-hour sessions and found significant decreases in the mean scores on the Hospital Depression scale.[14] Although pulmonary rehabilitation may improve depressive symptoms, not every patient has the time (approximately 3~4 hours per session) to complete such a regimen. In addition, the benefit of antidepressant drugs in elderly COPD patients has not been completely investigated.[11] This suggests that nurses working with COPD patients need an independent intervention they can use that will lessen depressive symptoms.

Acupressure, a type of massage, uses the acupuncture principles of Chinese medicine. It is a noninvasive therapy that stimulates meridians or points by means of pressure, usually using the hands or fingers to regulate life energy, called *qi* (chē) in Chinese.[15] According to the experience of clinical acupuncturists, the dyspnea found in COPD patients is related to depletion of fluids and *qi*, Lung *qi* vacuity, and then *qi* failing to govern this, or insufficiency of the Kidney origin, essence vacuity, insecurity of the root, and then *qi* failing to ensure containment.[16] The acupoints related to the Lungs, Large Intestine, Spleen, and Bladder channels, and the controlling and Governing Vessels, were often selected to relieve dyspnea.[17] Tang et al. found that major depressive symptoms were highly related to insufficiency of the Kidney essence.[18] Therefore, using the acupoints mentioned above to relieve dyspnea in COPD patients should produce the effect of reducing depressive symptoms. Maa et al. found that acupressure could improve dyspnea, as measured by a visual analog scale or St. George's respiratory questionnaire in COPD patients, but they did not explore the effects of acupressure in reducing depressive symptoms.[19,20] For this reason, a subject- and data collector–blinded, randomized, block experimental design was conducted for this study to test the effects of acupressure in reducing depressive symptoms in breathless patients with COPD.

MATERIALS AND METHODS

Patients sampling

Subjects were selected from the thoracic clinics at one medical center and three regional hospitals in Taipei, Taiwan. The sampling criteria included being diagnosed with COPD, not having any other health problems affecting the progress of their COPD, not having been hospitalized during the previous 2 months, not receiving pulmonary rehabilitation during the previous 6 months, and being able to speak the Mandarin or Taiwanese language. Data were collected from April to December 2000. There were 151 patients meeting the sampling criteria. Of these, 62 (41.06%) agreed to participate in this study. Of these 62 subjects, 12 withdrew during the scheduling of their intervention, and 6 were removed because of unsuccessful matching (Fig. 1). To achieve among-group comparability of certain characteristics, known as prognostic factors, age (4 categories), gender (2 categories), pulmonary function (3 categories), smoking (2 categories), and steroid use (2 categories), were created. These factors gave a total of 96 possible categories each subject could be matched into.[21] After matching, the 44 subjects were found to match into 17 of the 96 categories, with at least 2 subjects in each. These subjects were then randomly assigned to true- or sham acupressure groups. The completion rate for the 4 weeks of intervention was 100%. The study dropout rate was 19.4%.

Power analysis

Based on the study of Tsay et al., the mean and standard deviation of the Beck Depression Inventory scores of hemodialysis patients for the acupressure and control group were used to estimate the sample size in this study.[22] Sample size was estimated using power analysis for paired groups. A significance level of 0.05, an effect size of 0.58, and a power of 80% showed that 23 patients were needed in each group.
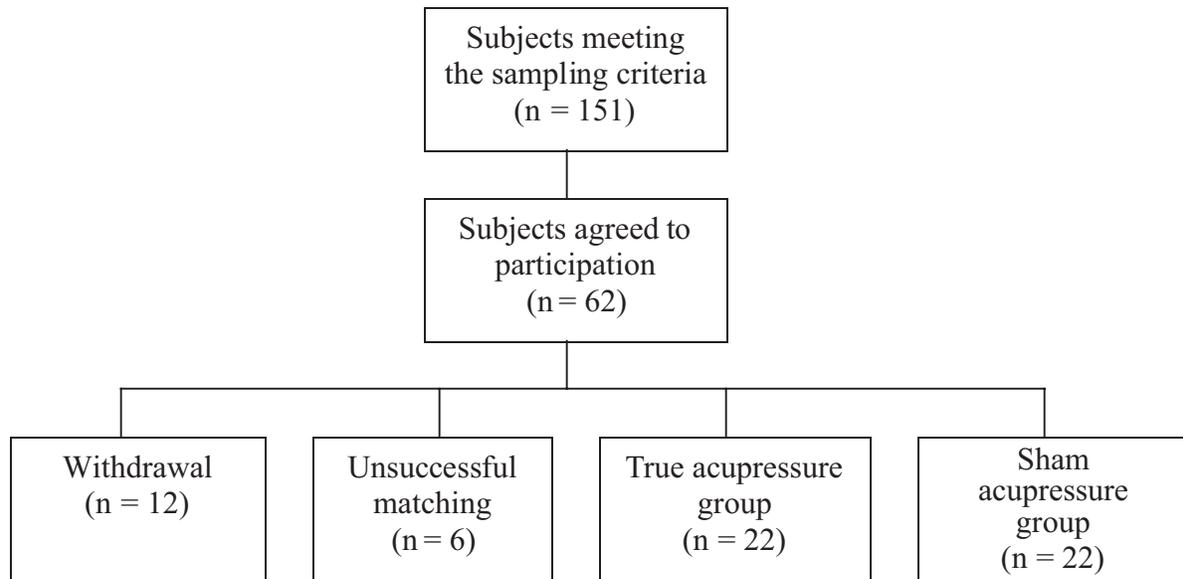
FIG. 1. Summary data for subject recruitment.

Procedure

A randomized, block experimental design was used for this study. The subjects and the data collector were blinded to the intervention assignments throughout the study. The true acupressure group received an acupressure program that used the acupoints of Great Hammer, Celestial Chimney, Lung Transport, Kidney Transport, and Fish Border—all of which have been shown to improve dyspnea. The sham acupoints used were Shang Hill, Supreme White, and Large Pile. Both acupressure treatments extended over 4 weeks and consisted of 16-minute sessions given five times a week (20 sessions). Both acupressure protocols were done by the investigator during the same period to avoid differences in administration. To prepare for the study, the in-

vestigator participated in a 30-hour acupuncture training program and 5 credits of Chinese medicine and acupressure/acupuncture theory. Acupressure was administered in each subject's home. A research assistant was blinded to measure the Geriatric Depression Scale (GDS) and a Dyspnea Visual Analogue Scale (DVAS) before and after the 4-week acupressure programs, while oxygen saturation and physiological indicators were measured before the program started and again after the twentieth (final) session (Table 1).

Purposes of the acupoints selected

The true acupressure group. Lung Transport and Celestial Chimney acupoints have been shown to decrease

TABLE 1. ACUPRESSURE PERFORMANCE: PROTOCOLS FOR THE TRUE- AND SHAM ACUPRESSURE GROUPS

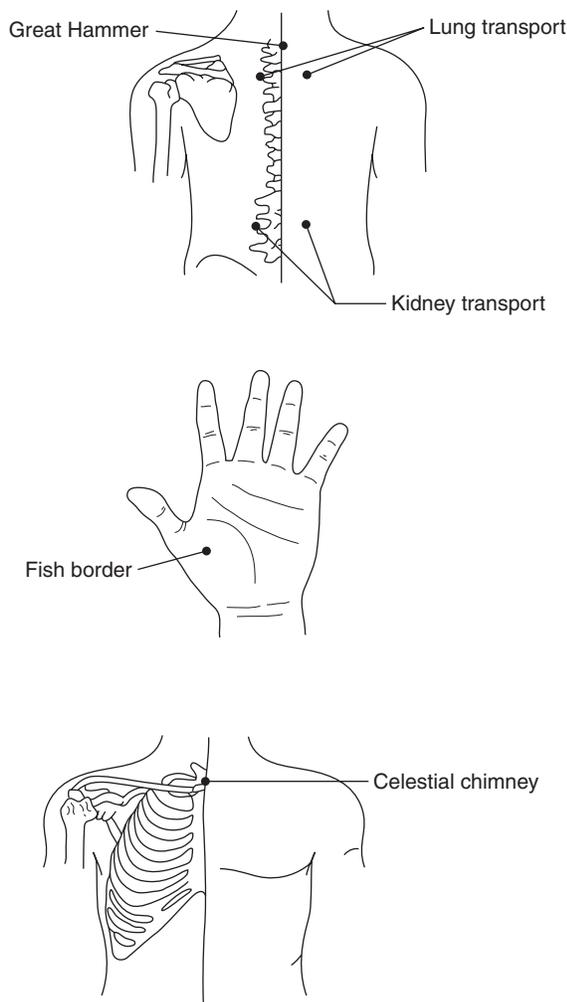|	*True acupressure group*			*Sham acupressure group*	
Technique	*Acupoints (see Fig. 2)*	*Time (minutes)*	*Technique*	*Acupoints* [a]	*Time (minutes)*
Effleurage	Neck and shoulders	4	Effleurage	Neck and shoulders	4
Press and rub	Great Hammer (GV14)	3	Press and rub	Shang Hill (Sp5)	4
Press	Celestial Chimney (CV22)	1.5	Press and rub	Supreme White (Sp3)	4
Press and rub	Lung Transport (B13) (two sides)	3	Point (using a fingertip)	Large Pile (Liv1)	4
Press and rub	Kidney Transport (B23) (two sides)	1.5			
Press and rub	Fish Border (L10) (one side)	3			

[a]See Figure 3.

FIG. 2. Acupoints in the true acupressure group.

respiratory airway resistance by regulating lung *qi*, clearing vacuity Heat, Cough suppression, the transforming of Phlegm, and the clearing of the throat.[23,24] The Kidney Transport acupoint was chosen, as this acupoint is proposed to secure the Root and bank up the origin, boost and secure the Lung and Kidney, and enhance one's constitution.[25] Great Hammer acupoints are said to diffuse the Lung and calm panting to lessen symptoms such as cough, panting, or lung distention.[25] Fish Border acupoints relieve dyspnea more immediately than other acupoints in the Lung meridian and can be matched with the Lung Transport and the Great Hammer[17] (see Fig. 2).

The sham acupressure group. Different acupoints in the same meridian may generate different effects, and the same ganglionic section in different meridians may produce the same effects. To avoid confounding effects, acupoints in different meridians and ganglionic sections from the true acupressure group were chosen (Fig. 3). The subjects in this study were elders, and the aging process had decreased

intestinal function,[26] so the sham acupoints were selected to promote intestinal movement and increase intestinal circulation.

Reliability and validity of acupressure protocols

Content validity of the acupressure protocols. Five Chinese medicine experts being physicians or associate professors in Chinese medicine were requested to independently rate the correctness of the acupoints selected, the amount of time the pressure was applied, and the techniques and procedures used during acupressure. These were rated using a 4-point scale. Results showed that all of the ratings were above 3 (4 = *very proper*, 3 = *proper*) (see Table 2).

Reliability of acupressure protocols. The consistency and stability of the force of the fingers was as follows: A 7.5-kg platform scale, which met the criterion of the Central Standards Measurement Bureau, was used to measure the force of the fingers. The platform scale was pressed for 5 seconds and repeated 10 times, using the thumb and forefinger of both hands with the scale's readout blocked from view. The goal was to maintain a consistent acupressure force of between 3 and 5 kg for at least 5 seconds at each attempt without being able to view the scale's readout. An assistant would record the force during the fifth second. The investigator applied an average pressure of the thumb and forefinger of both hands, ranging from 3.40 to 4.40 kg (standard deviation, 0.11~0.25). Each measurement was performed using the same place, height, and on different dates and time (see Table 3). In addition, a "tiredness" factor of finger pressure was determined. The force of finger pressure before the first subject was treated and after the last subject was treated on the same day every week was measured. The mean force during treatments was 4.15 and 3.76 kg before and after acupressure interventions, respectively.

The accuracy of acupoints location was as follows: All the acupoints (eight acupoints) used in the true- and sham acupressure groups were identified on another 20 patients in the acupuncture department of a regional hospital in Taipei. The accuracy of acupoint location was confirmed by
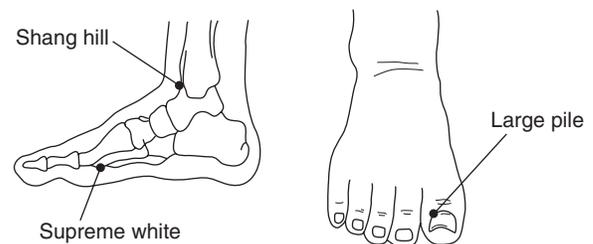

FIG. 3. Acupoints in the sham acupressure group.

TABLE 2. CONTENT VALIDITY OF THE ACUPRESSURE PROTOCOLS ($N = 5$)

Items	Very proper (n)	Proper (n)
Acupoints		
Great Hammer	4	1
Celestial Chimney		5
Lung Transport (two sides)	4	1
Kidney Transport (two sides)	2	3
Fish Border (one side)	3	2
Shang Hill	1	4
Supreme White	3	2
Large Pile	1	4
Techniques and time		
Effleurage neck and shoulders	3	2
4 minutes	4	1
Press and rub Great Hammer	4	1
3 minutes	3	2
Press Celestial Chimney	2	3
1.5 minutes	2	3
Press and rub (two sides) Lung Transport at the same time	4	1
3 minutes	3	2
Press and rub (two sides) Kidney Transport at the same time	3	2
1.5 minutes	3	2
Press and rub Fish Border	4	1
3 minutes	3	2
Press and rub Shang Hill	3	2
4 minutes	3	2
Press and rub Supreme White	3	2
4 minutes	3	2
Point (using a fingertip) Large Pile	4	1
4 minutes	3	2
Protocols		
True acupressure group	5	0
Sham acupressure group	5	0

a visiting staff member, and a 99% accuracy level was achieved.

Intrarater reliability of performing acupressure protocols was as follows: The acupressure manipulations of true- and sham acupressure groups were video-recorded on two separate dates (April 1 and April 3, 2000). These acupressure manipulations of true- and sham acupressure groups were applied to subjects who were not included in the formal study. The first and second video recordings were viewed simultaneously. The two videos were observed for use of the same technique, same procedures, and a less-than-5-second timing difference. The results showed that the consistency of acupressure manipulation in both groups was 100%, and that the observed timing difference of the two observed procedures in both groups ranged from 0 to 4 seconds (see Table 4).

Outcome measurements

Geriatric Depression Scale (GDS). Depression has been defined as a reaction to an identifiable psychosocial stressor or multiple stressors.[5] The 30-item GDS scale has been widely used as a self-reporting measure of depression in old age.[27,28] Sheikh et al. extracted a short 15-item version focused on the two factors of being easily tired and distracted attention in the aged.[29] They showed the correlation between depression levels of *Diagnostic and Statisti-*

TABLE 3. THE CONSISTENCY AND STABILITY OF THE FORCE OF THE FINGERS

	The thumb of the right hand (n = 10)		The forefinger of the right hand (n = 10)		The thumb of the left hand (n = 10)		The forefinger of the left hand (n = 10)	
	M (SD)	Range	M (SD)	Range	M (SD)	Range	M (SD)	Range
Force (kg)	4.04 (0.25)	3.6–4.4	3.75 (0.23)	3.4–4.1	3.78 (0.11)	3.6–3.9	3.75 (0.17)	3.4–4.0

M, mean; SD, standard deviation.

TABLE 4. INTRARATER RELIABILITY IN PERFORMING THE ACUPRESSURE PROTOCOL

Steps	First recording (minutes:seconds)	Second recording (minutes:seconds)	Difference (seconds)
True acupressure group			
Effleurage neck and shoulders for 4 minutes	2:00	2:03	3
Press and rub Great Hammer for 3 minutes	2:59	3:02	3
Press Celestial Chimney for 1.5 minutes	1:29	1:31	3
Press and rub Lung Transport for 3 minutes	3:00	3:00	0
Press and rub Kidney Transport for 1.5 minutes	1:28	1:32	4
Press and rub Fish Border for 3 minutes	2:59	3:00	1
Sham acupressure group			
Effleurage neck and shoulders for 4 minutes	2:00	1:58	2
Press and rub Shang Hill for 4 minutes	4:02	4:00	2
Press and rub Supreme White for 4 minutes	3:59	4:00	1
Point (using a fingertip) Large Pile for 4 minutes	3:59	4:00	1

cal Manual of Mental Disorders, third edition (DSM-III)[29] and short GDS scores to be 0.84 ($p < 0.001$) among their study's depressive patients.[30] In our study, subjects with COPD were, likely to tire easily; hence, the short 15-item Chinese version of the GDS was used. Chan reported an internal consistency of 0.79 for the 15-item Chinese version.* The scale uses dichotomous responses, with 0 indicating "No" and 1 indicating "Yes." For clinical purposes, a score of 5–9 is merely suggestive of depression, whereas a score of 10 or greater almost always indicates depression.[30]

Dyspnea Visual Analogue Scale (DVAS). Patients indicated their perception of dyspnea discomfort on a 100-mm vertical line. The distance from the origin to the indicated mark was measured, with a greater distance indicating a more severe dyspnea level being experienced. The correlation of the DVAS with a horizontal analog scale was 0.97, and a negative correlation of −0.85 with the Peak Expiratory Flow Rate was found.* Construct validity was confirmed by differences in the dyspnea scores during severe and mild obstructive symptoms among patients with asthma and COPD.[31]

*Chan YJ. The correlation of protein, calorie, and malnutrition in long-term care residents. Taipei, Taiwan: National Yang Ming University, 1999, master's thesis.

Oxygen saturation. A pulse oximeter, a Nonin Onyx 9500 (Nonin, N. Plymouth, MN), was used to measure oxygen saturation in the finger. The measurement bias of the pulse oximeter was ± 3%.

Physiologic indicators. The systolic and diastolic blood pressure (SBP and DBP), respiratory rate (RR), and heart rate (HR) were collected before and after each session.

Data analysis

Data were coded and analyzed using descriptive statistics, the paired-samples t test, and stepwise multiple linear regression. Statistical analysis was done using the Statistical Package for the Social Sciences (SPSS, SPSS, Inc., Chicago, IL), version 13.0 for Windows.

RESULTS

The average age of each the subjects was 73 ± 9.7 years old. Most subjects were men (81.8%). More than 80% subjects were married and lived with their children. Eighty-six percent (86%) of subjects had given up smoking or were nonsmokers, and none of the subjects used oxygen during the course of the study. Most subjects

TABLE 5. COMPARISONS OF MEAN DIFFERENCES OF GDS AND DVAS AMONG THE TWO GROUPS ($N = 44$)

Variables	True acupressure group (n = 22) M (SD)	Sham acupressure group (n = 22) M (SD)	Paired samples t test
GDS scores	−2.09 (1.54)	0.14 (1.61)	−4.70*
DVAS scores	−1.60 (1.19)	0.69 (0.92)	−4.59*

Note: Md, Σ(post-test scores–pretest score)/22 subjects.
GDS, Geriatric Depression Scale; DVAS, Dyspnea Visual analogue Scale; SD, standard deviation.
*$p < 0.001$.

TABLE 6. COMPARISONS OF MEAN DIFFERENCES AT THE TWENTIETH SESSION FOR OXYGEN SATURATION AND PHYSIOLOGICAL INDICATORS AMONG THE TWO GROUPS ($N = 44$)

Variables	True acupressure group (n = 22) M (SD)	Sham acupressure group (n = 22) M (SD)	Paired samples t test
SBP (mmHg)	−10.96 (9.38)	−3.14 (7.30)	−3.20**
DBP (mmHg)	−2.09 (6.30)	1.05 (4.62)	−1.75
HR (times per minute)	−6.36 (4.07)	−1.73 (7.75)	−2.54*
RR (times per minute)	−2.36 (1.84)	1.55 (2.46)	−6.27***
Oxygen saturation (percent)	1.23 (1.07)	−1.05 (1.00)	6.75***

Note: Md, Σ(post-test scores–pretest scores of the twentieth session)/22 subjects.
SBP, systolic blood pressure; DBP, diastolic blood pressure; HR, heart rate; RR, respiratory rate.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

(54.5%) had a severe breathing obstruction. All of the subjects used bronchodilators, and 60% took steroids. The mean length of time that patients had COPD was 7.91 ± 7.83 years.

After the intervention, the GDS scores in the true acupressure group decreased by 2.09 points, whereas those in the sham acupressure group increased by 0.14 points. Using the paired-samples t test, significant differences of intervention effects were found between the 2 groups, with GDS scores decreasing in the acupressure group. For the post-test DVAS scores, the paired-samples t test ($p < 0.001$) showed that the differences of intervention effects in the true acupressure group were more than those in the sham acupressure group, indicating that dyspnea in the true acupressure group improved more than in the sham acupressure group (see Table 5).

The mean differences of oxygen saturation and physiological indicators in pre- and postintervention at the twentieth session were compared. Using a paired-samples t test analysis, the mean difference scores between the 2 groups indicated that oxygen saturation in the true acupressure group improved significantly more than in the sham acupressure group ($p < 0.001$). The intervention effects between pre- and postintervention for SBP, RR, and HR in the 2 groups were significantly different ($p < 0.001$). DBP showed no significant difference between pre- and postintervention between the 2 groups (see Table 6).

To further investigate dyspnea reduction as a mediator between true acupressure and depression, a stepwise multiple linear regression was conducted on changes in GDS with changes in dyspnea, an indicator of the acupressure treatment, and baseline GDS. The result showed that changes in dyspnea was the only statistically significant predictor of changes in GDS ($\beta = 0.64$; $p = 0.00$). The acupressure treatment indicator and baseline dyspnea were regressed on changes in dyspnea, with both found to be statistically significant predictors of changes in dyspnea ($\beta = -0.74$, $p = 0.00$; $\beta = -0.33$, $p = 0.001$; see Table 7). The results revealed that depression could be influenced by true acupressure through changes in dyspnea.

DISCUSSION

Sixty-three-point-six percent (63.6%; 28/44) of COPD subjects had an indication of depression. The prevalence of depression in this study exceeded the 42% of elderly COPD outpatients found in a study in America[6] and the 40% mixed-aged COPD outpatients in a Taiwan study by Tsai.[7] The

TABLE 7. CORRELATION BETWEEN CHANGES IN GDS AND DYSPNEA AS DEPENDENT VARIABLES AND OTHER PARAMETERS IN ALL SUBJECTS ($N = 44$)

Dependent variable predictors	R^2	Regression coefficient (β)	SE	F value	p value
Changes in GDS					
Changes in dyspnea	0.42	0.64	0.15	29.76	0.00
Acupressure treatment					
Changes in dyspnea					
Acupressure treatment	0.55	−0.74	0.28	39.34	0.00
Baseline in dyspnea	0.66	−0.33	0.06		

SE, standard error; GDS, Geriatric Depression Scale.

number of COPD subjects with a clinical diagnosis of depression, as identified by their physicians, was lower than those with depression, as measured by the GDS. The 63.6% of COPD subjects in this study who did not receive medical attention were neither diagnosed with depression, nor were they put on antidepressive medications during the study.

Being unable to breathe is a very frightening experience. Patients with COPD complicated by chronic hypoxemia also complained of a disabling breathlessness and reduced exercise capacity, as well as depression.[8,32,33] The acupressure program led to decreases in dyspnea, with subjects feeling less breathless and thus better able to carry out their daily activities. The fear subjects had of being unable to breathe was decreased, and this may have contributed to the decrease in depression. Our findings confirmed that acupressure, using true acupoints, resulted in decreased depression through decreased dyspnea, suggesting the positive mediational role of dyspnea reduction through acupressure.

After the 4-week acupressure program, the changes in SBP, HR, and RR among the true acupressure group were more improved than those in the sham acupressure group. The obvious significant decrease in these physiological indicators in the true acupressure group may be the result of relieving dyspnea and thus producing a relaxed response. Mok et al.[34] and Post-White et al.[35] found that massage decreases blood pressure, RR, and HR in elderly stroke and cancer patients, and these findings are similar to the results found in our study.

Limitations

Because of some deficits in the study, several limitations were recognized:

1. Only one third of the potential patients initially agreed to participate in the study. Although no significant differences of gender, age, and pulmonary function between patients who completed the study and dropouts was found, the high initial refusal rate might affect the generalization of the findings.
2. The investigator used five and three acupoints in the true and sham acupressure groups, respectively. Whether the number of acupoints influenced the results needs further investigation.
3. Besides the GDS, other objective measurements, such as serotonin, dopamine, norepinephrine, and magnetic resonance imaging to demonstrate structural changes in the brain, are recommended.[5]
4. Of the subjects in this study 81.8% were men. Chavannes et al.[8] found that depressive symptoms in COPD appeared to be associated with females. The impact of gender on the effects of acupressure need to be considered in future studies.
5. We did not explore the length of time the effects of acupressure persisted. Explorations on the length of time that acupressure continues to lessen dyspnea are needed.

CONCLUSIONS

Several investigators had explored the impact of acupressure on improving fatigue, sleep quality, and depressed mood in patients on hemodialysis and end-stage renal disease.[21,36] In western countries, nurses in many nursing development units use massage techniques in routine daily nursing care.[37] This acupressure program only took 16 minutes per day, 5 days a week, to be implemented. It not only may decrease the usage of antidepressant medication, but may also relieve dyspnea and improve depressive symptoms in select patients. The staff resources needed to implement an acupressure program could very well be favorably balanced by a consequent reduction in resource time in dealing with COPD and its resultant symptoms, not to mention the potential improvement in these patients' quality of life. For breathless COPD patients, nurses who have received training in acupressure are in a key position to identify depressive symptoms and use this nonpharmacological treatment to lessen them.

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