

Effects of Practicing Ikebana on Anxiety and Respiration

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Abstract

Handwork is useful in psychosocial rehabilitation. Working with flowers is especially beneficial because people can observe the beauty of the flowers. Ikebana, the Japanese traditional art of flower arrangement, is considered beneficial to mind-body health. In this study, we examined the emotional state and respiration in 10 healthy subjects before and after practicing Ikebana. State anxiety, pleasant/unpleasant feelings and respiratory rate (RR) were measured before and after flower arranging. Subjects in the high trait anxiety group showed a statistically significant decrease in state anxiety score, unpleasant feelings and RR as well as an increase in pleasant feelings after practicing Ikebana. There were no significant differences in these parameters before and after flower arranging for subjects in the low trait anxiety group. The results suggest that Ikebana is beneficial in reducing stressful feelings and anxiety, with these changes reflected in lower RR.

Keywords: Ikebana; Flower arrangement; Art; Trait anxiety; State anxiety; Respiratory rate

Introduction

People live in a variety of situations in society and experience both negative and positive emotions, such as joy and pleasure as well as sadness and anxiety. They try to avoid or escape negative emotions using different methods, such as engaging in hobbies or owning a pet. These strategies can be effective in relaxing and calming the mind and body. There has been an increase in research related to the use of mindfulness-based interventions in the treatment of mental and physical illness [1,2]. These interventions can alleviate depression, anxiety and various stress-related physical symptoms. For example, exercise and yoga were introduced in the general population as treatments for anxiety and depression [3,4]. Handwork is also considered a useful mindfulness-based intervention to address negative emotions. Working with flowers can positively influence human emotions and is sometimes used in psychosocial rehabilitation [5]. It is beneficial not only as a kind of artistic handwork, but also contributes to a sense of beauty and happiness. Ikebana, Japanese flower arrangement, is a traditional Japanese art form which has been in existence for 600 years. We feel positive emotions when we observe beautiful flower arrangements, such as those created using Ikebana [6]. However, there are few studies that have examined the effect of Ikebana on psychological and physiological responses in humans.

Change in respiratory rate has been correlated with trait anxiety scores of subjects experiencing anticipatory anxiety [7]. This respiratory response is termed "behavioral breathing" [8]. The respiratory rhythm in behavioral breathing most likely originates in the amygdala where emotional responses are believed to be generated.

During emotional breathing, olfactory stimulation can produce respiratory changes. Unpleasant odors increase respiratory frequency, whereas pleasant odors decrease it [9]. The psychological and

physiological effects of viewing photos of Ikebana have been studied [6]. Findings showed that subjects' respiratory rate decreased, and their sense of pleasantness increased, with an accompanying decrease in anxiety scores.

The present study measured and compared respiratory frequency and feelings of pleasantness and unpleasantness when subjects practiced Ikebana. In addition, we investigated the association of subjects' anxiety scores with respiratory frequency and the degree of pleasant and unpleasant feelings. The study was undertaken to assess whether Ikebana is beneficial to reduce stressful feelings and anxiety, and whether these changes are correlated with respiration.

Methods

Subjects

Ten healthy female subjects (3 married; 7 single) aged 25 to 54 years (43.6 ± 8.57 : mean \pm SD) participated in this study. No subjects had a psychiatric or neurological disorder. The experiment was performed in a quiet schoolroom used for Sogetsu Ikebana School located at Meguro-ku, Tokyo, Japan. All subjects had practiced Ikebana 2-3 times per month at this school for 3-15 years. This study was approved by the Ethics Committee of Showa University School of Medicine (No. 66). Written informed consent was obtained from all subjects.

Procedure and measurements

This study was performed as a single trial to assess how psychological and physiological parameters differ between before ("pre" in the figures) and after ("post" in the figures) practicing Ikebana. Total trial duration took 2 hours including testing psychological and physiological measurements, and practicing Ikebana. Before practicing Ikebana, their anxiety levels were assessed with Spielberger's State-Trait Anxiety Inventory (STAI) [10] and their

pleasantness was tested using a visual analogue scale (VAS). Then subjects were asked to sit on a chair installed at the corner of the same room and remain quiet for 5 min. Chest wall movement for measurement of respiratory rate (RR) was measured with a respiratory belt (described below) for 3 min. Then subjects were asked to move to the Ikebana practice room with ten tables (sized 200 cm×50 cm). Each subject was assigned to their own table and asked to arrange flowers on their own table. Practicing Ikebana took about one hour to complete their own arrangements using their favorite vase. The types of flowers were selected beforehand by an expert Ikebana instructor. For the first 30 to 45 minutes, subjects were instructed to concentrate on arranging flowers in the vase in their own fashion. No discussion or consultation was allowed. Subjects completed their flower arrangement and asked the instructor for suggestions to fix or improve the arrangements. This took about 15 minutes.

After practicing Ikebana, each subject was asked to sit on the same chair installed at the corner of the room to test their anxiety levels with STAI. RR was also measured with the respiratory belt in the same manner as before practicing Ikebana.

Psychological measurements

The anxiety level of the subjects was assessed using STAI [10], an instrument comprising two scales with 20 statements each that measure either trait or state anxiety. The trait anxiety scale evaluates how subjects feel in general, and the state anxiety scale evaluates how subjects feel 'right now' in various situations. Anxiety levels for subjects are indicated by scores ranging from 20 to 60. The trait score is generally stable, while the state score changes depending on the situation. Trait scores ≥ 45 indicate high trait anxiety, and scores < 45 reflect normal or low trait anxiety. In this experiment, the high trait anxiety group was labeled H, and the normal or low trait anxiety group was labeled L.

Subjects were asked to assess their sense of pleasantness or unpleasantness (stressfulness) using the VAS [11]. The VAS consisted of a 20 cm horizontal line, with the extreme left defined as "extremely unpleasant" and the extreme right defined as "extremely pleasant". The score at the extreme left was -100, that at the extreme right was 100, and the midline was 0.

Physiological measurements

A Velcro extension belt (MLT1132, AD Instruments, Aichi, Japan) was used to assess the subject's respiration through the measurement of changes in thoracic circumference, and RR was recorded with PowerLab (ML846, AD Instruments, Aichi, Japan). Each subject's RR was calculated on the software for analysis, Scope, installed on a laptop computer (VAIO VGN-SR91NSA; Sony, Tokyo, Japan). The measurement of RR was performed in the same manner as in our previous study [12].

Statistical analysis

All data were statistically analyzed using SigmaPlot 12.0 (Systat Software Inc., San Jose, CA, USA) or GraphPad (InStat Software Inc., LaJolla, CA, USA). The nonparametric Wilcoxon matched-pairs signed-ranks test was used to analyze changes in state anxiety, VAS score and RR before and after Ikebana (Figures 1A, 2A and 3A). We analyzed the changes in state anxiety, VAS score and RR between the four conditions (pre and post in the high and low trait anxiety groups) by a one-way analysis of variance. Then, post-hoc tests between the

four conditions were performed using the Bonferroni procedure (Figures 1B, 2B and 3B).

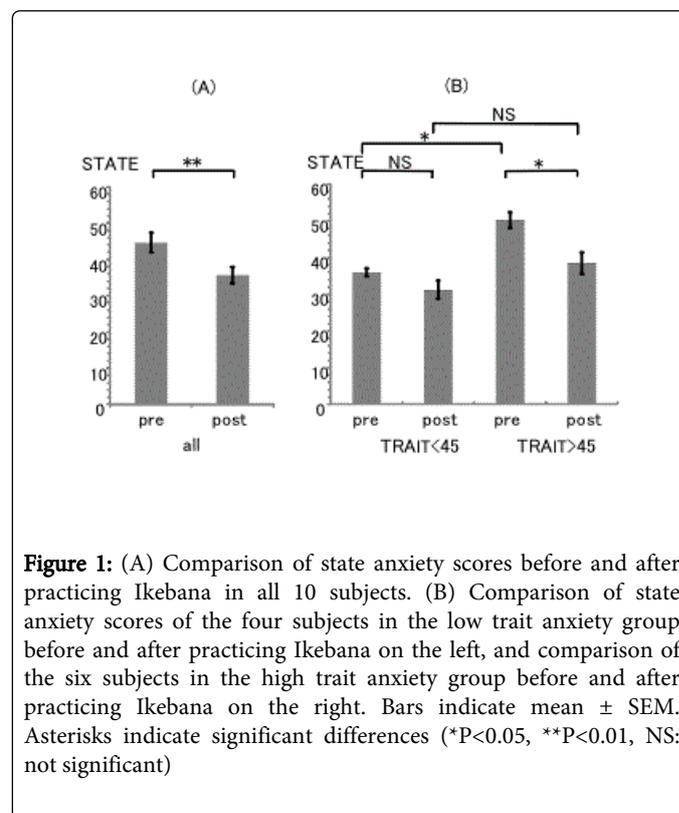


Figure 1: (A) Comparison of state anxiety scores before and after practicing Ikebana in all 10 subjects. (B) Comparison of state anxiety scores of the four subjects in the low trait anxiety group before and after practicing Ikebana on the left, and comparison of the six subjects in the high trait anxiety group before and after practicing Ikebana on the right. Bars indicate mean \pm SEM. Asterisks indicate significant differences (* $P < 0.05$, ** $P < 0.01$, NS: not significant)

Pearson's correlation coefficient (r) was used to study the relationships between data. The relationship between state anxiety and VAS before and after Ikebana and linear regression slopes and intercepts between pre and post were examined and compared using a parallel-line analysis (SigmaPlot 12).

Subject No.	Age Year	STAI		
		TRAIT	STATE pre	STATE post
1	33	33	49	30
2	38	50	59	33
3	39	31	34	30
4	49	52	45	42
5	47	46	38	38
6	54	34	34	26
7	53	54	45	41
8	47	39	38	31
9	25	52	51	35
10	44	47	53	50
mean \pm SD	43.6 \pm 8.57	43.8 \pm 8.77	44.6 \pm 8.50	35.6 \pm 7.20

Table 1: Individual STAI scores for 10 normal subjects.

Results

STAI and VAS scores

Age as well as individual trait and state anxiety scores before and after practicing Ikebana are shown in Table 1. Trait anxiety scores varied from 31 to 54, with a mean score of 43.8 ± 8.77 (mean \pm SD), which is within the normal range.

State anxiety scores varied from 28 to 53 before and from 20 to 40 after practicing Ikebana, with mean scores of 44.6 ± 8.5 (mean \pm SD) and 35.6 ± 7.2 (mean \pm SD), respectively. The mean state anxiety score after (STATE post) was significantly lower than the mean state score before (STATE pre) practicing Ikebana ($P < 0.05$) (Figure 1A).

The mean state anxiety score for the high trait anxiety group (trait anxiety score > 45) was 50.3 ± 5.32 (mean \pm SD) before (H-STATE pre) and 38.5 ± 7.29 (mean \pm SD) after (H-STATE post) practicing Ikebana (Figure 1B).

The mean state anxiety score for the low trait anxiety group (trait anxiety scores < 45) was 36 ± 2.31 (mean \pm SD) before (L-STATE pre) and 31.25 ± 4.99 (mean \pm SD) after (L-STATE post) practicing Ikebana (Figure 1B). The mean H-STATE post score was significantly lower than the H-STATE pre score ($P < 0.01$). However, the mean L-STATE post score was not significantly lower than the L-STATE pre score ($P = 0.25$).

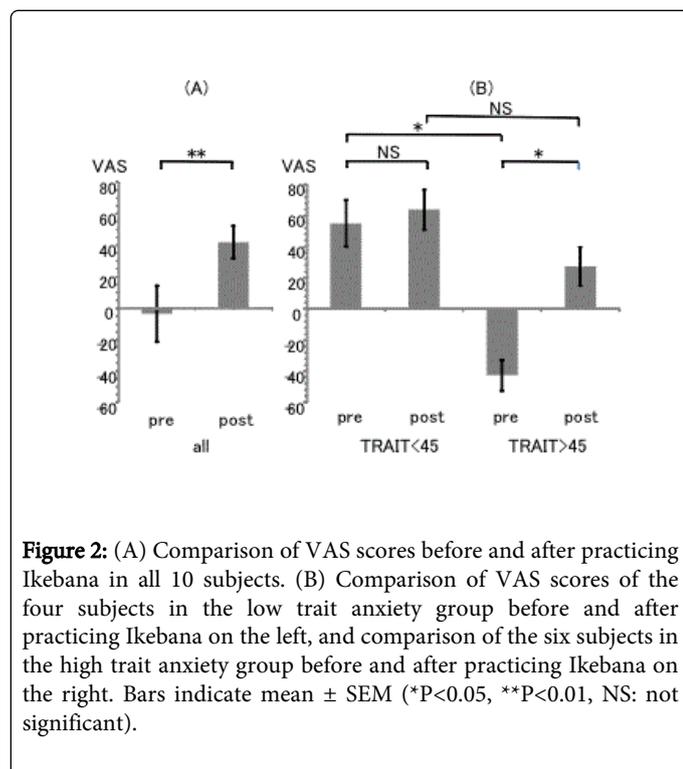


Figure 2: (A) Comparison of VAS scores before and after practicing Ikebana in all 10 subjects. (B) Comparison of VAS scores of the four subjects in the low trait anxiety group before and after practicing Ikebana on the left, and comparison of the six subjects in the high trait anxiety group before and after practicing Ikebana on the right. Bars indicate mean \pm SEM (* $P < 0.05$, ** $P < 0.01$, NS: not significant).

The mean VAS score of -3.6 ± 56.2 (mean \pm SD) before (VAS pre) was significantly lower than the mean score of 41.9 ± 32.9 (mean \pm SD) after (VAS post) practicing Ikebana ($P < 0.05$) (Figure 2). A comparison of the relationship between VAS and state anxiety scores showed a linear relationship between VAS pre and STATE pre ($r = -0.9235$, $P < 0.001$) and between VAS post and STATE post ($r = -0.7964$, $P < 0.01$) (Figure 3A), indicating a strong negative correlation between unpleasant stressful feelings or pleasant relaxed feelings and state

anxiety scores. An analysis of covariance was used to analyze whether there was an correlation between VAS pre and post.

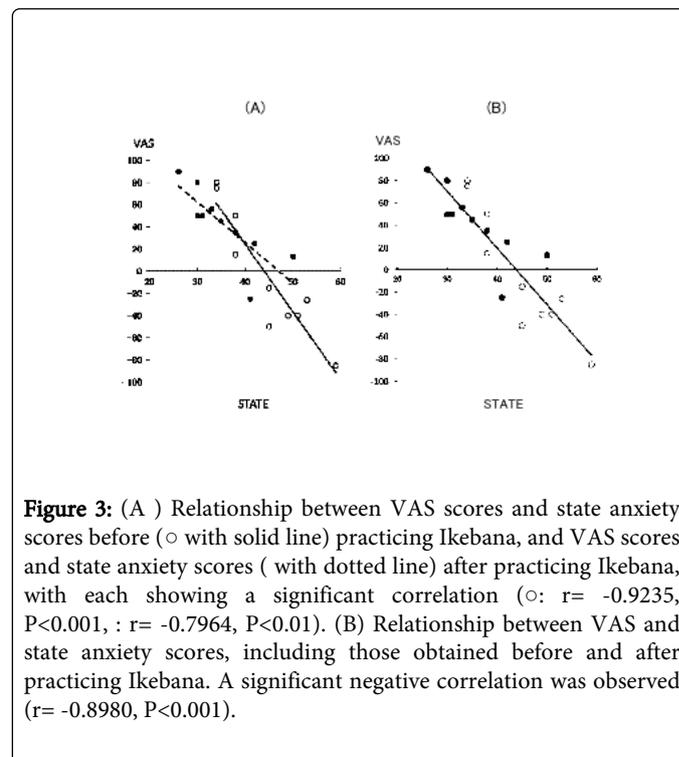


Figure 3: (A) Relationship between VAS scores and state anxiety scores before (\circ with solid line) practicing Ikebana, and VAS scores and state anxiety scores (\bullet with dotted line) after practicing Ikebana, with each showing a significant correlation (\circ : $r = -0.9235$, $P < 0.001$, \bullet : $r = -0.7964$, $P < 0.01$). (B) Relationship between VAS and state anxiety scores, including those obtained before and after practicing Ikebana. A significant negative correlation was observed ($r = -0.8980$, $P < 0.001$).

A parallel-line analysis, with state anxiety as a covariate, did not reveal significant intergroup differences in VAS pre and post. A highly statistically significant negative correlation was observed between all state anxiety scores and all VAS scores ($r = -0.8980$, $P < 0.001$) (Figure 3B).

The mean VAS score of the high trait anxiety group was -42.7 ± 24.1 (mean \pm SD) before (H-VAS pre) and 27.3 ± 30.3 (mean \pm SD) after (H-VAS post) practicing Ikebana (Figure 2B). For the low trait anxiety group, the mean VAS score was 55 ± 29.7 (mean \pm SD) before (L-VAS pre) and 63.8 ± 25.6 (mean \pm SD) after (L-VAS post) practicing Ikebana. The mean H-VAS post score was significantly higher than the H-VAS pre score ($P < 0.001$). However, the mean L-VAS post score was not significantly higher than the L-VAS pre score ($P = 0.067$).

STAI scores and RR

The mean RR of all subjects during quiet breathing was 18.1 ± 3.76 (mean \pm SD) before (RR pre) and 14.9 ± 3.38 (mean \pm SD) after (RR post) practicing Ikebana, with RR post significantly lower ($P < 0.001$) (Figure 4A).

The mean RR in the high trait anxiety group was 20.3 ± 2.88 (mean \pm SD) before (H-RR pre) and 16.2 ± 3.13 (mean \pm SD) after (H-RR post) practicing Ikebana (Figure 4B), representing a statistically significant difference ($P < 0.05$). Mean RR in the low trait anxiety group was 14.8 ± 1.89 (mean \pm SD) before (L-RR pre) and 13.0 ± 3.16 (mean \pm SD) after (L-RR post) practicing Ikebana (Figure 4B). In contrast to the high trait anxiety group, the L-RR post score was not significantly lower ($P = 0.3790$).

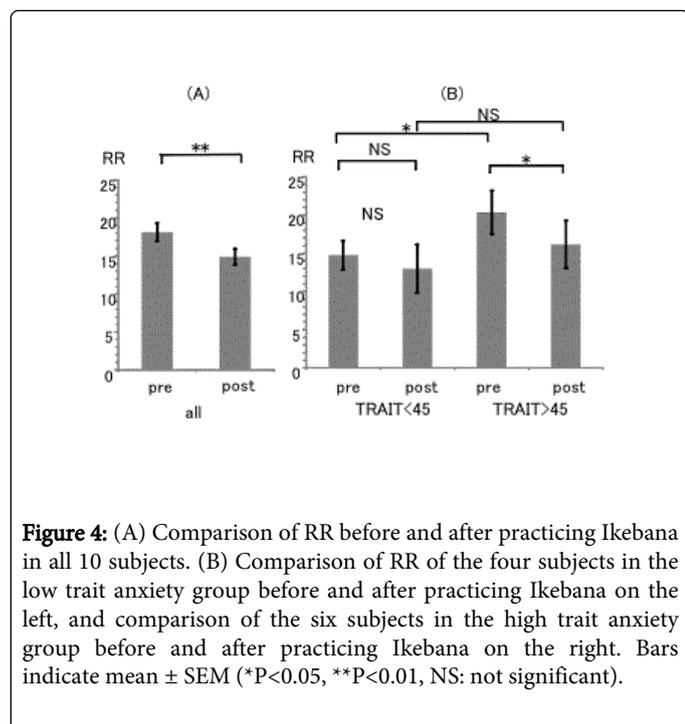


Figure 4: (A) Comparison of RR before and after practicing Ikebana in all 10 subjects. (B) Comparison of RR of the four subjects in the low trait anxiety group before and after practicing Ikebana on the left, and comparison of the six subjects in the high trait anxiety group before and after practicing Ikebana on the right. Bars indicate mean \pm SEM (* $P < 0.05$, ** $P < 0.01$, NS: not significant).

A statistically significant positive correlation was observed between RR and trait anxiety scores before ($r = 0.7298$, $P < 0.05$), but was not observed after practicing Ikebana ($r = 0.3216$, $P = 0.3648$) (Figure 5A). A significant negative correlation was observed between RR pre and post and trait anxiety scores ($r = -0.7688$, $P < 0.01$) (Figure 5B).

Discussion

In this study, we examined the effects of practicing Ikebana on feelings of pleasantness, physiological responses of respiratory rate and state anxiety. After practicing Ikebana, we found that subjects in the high trait anxiety group showed a statistically significant decrease in state anxiety score, unpleasant feelings and RR. Subjects' pleasant feelings increased after practicing Ikebana. On the other hand, there were no significant differences in these parameters for subjects in the low trait anxiety group.

State anxiety and VAS scores

State anxiety is generally measured as how one feels 'right now' in a variety of situations and is affected by various environmental and mental factors [10]. Subjects' state anxiety scores varied from 34 to 59 in our experiment, with a mean score of 44.6 ± 8.50 (mean \pm SD) before Ikebana.

Scores from 42 to 50 on the STAI indicate high anxiety. State anxiety scores became lower in 9 out of 10 subjects, with the mean score decreasing to 35.6 ± 7.20 (mean \pm SD), which is within the category of normal anxiety (31 to 41). This indicated that flower arranging had an influential effect on the anxiety level. Trait anxiety scores varied from 31 to 52, with scores for four subjects below 45, which is in the category of normal to low anxiety on the STAI. Six subjects had a trait anxiety score over 45, indicating high anxiety. As shown in Figure 1, the mean state anxiety scores of the four subjects in the low trait anxiety group before and after flower arranging were not significantly different. In contrast, state anxiety scores of the six

subjects in the high trait anxiety group before and after practicing Ikebana were significantly different.

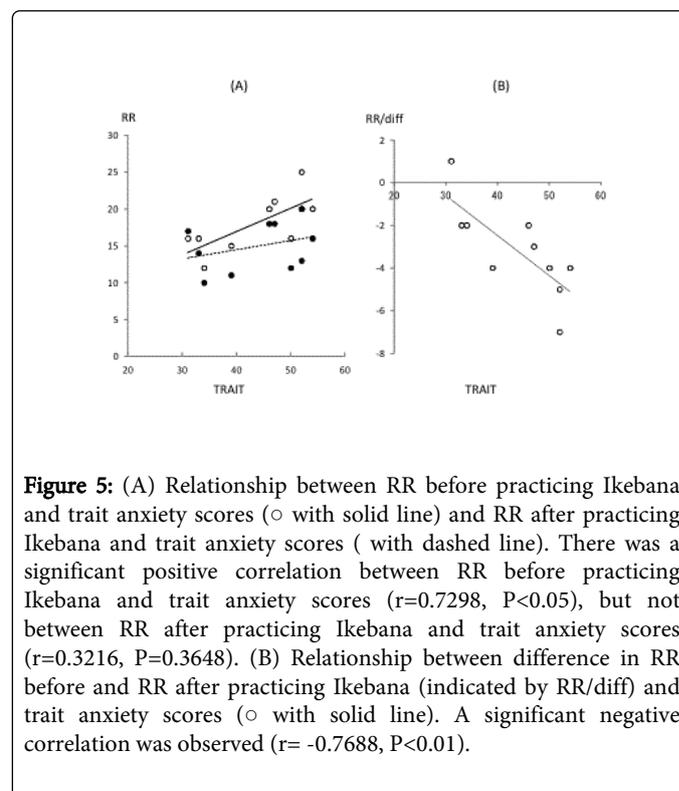


Figure 5: (A) Relationship between RR before practicing Ikebana and trait anxiety scores (\circ with solid line) and RR after practicing Ikebana and trait anxiety scores (\bullet with dashed line). There was a significant positive correlation between RR before practicing Ikebana and trait anxiety scores ($r = 0.7298$, $P < 0.05$), but not between RR after practicing Ikebana and trait anxiety scores ($r = 0.3216$, $P = 0.3648$). (B) Relationship between difference in RR before and RR after practicing Ikebana (indicated by RR/diff) and trait anxiety scores (\circ with solid line). A significant negative correlation was observed ($r = -0.7688$, $P < 0.01$).

This indicates that subjects with high trait anxiety were quite sensitive to the effect of practicing Ikebana. This sensitivity in those with high trait anxiety has also been shown in other tasks that affect anxiety level [7].

The fact that state anxiety scores after practicing Ikebana were not significantly different between high and low anxiety groups shows that such an activity is especially beneficial to subjects with high trait anxiety.

A VAS has been widely used to measure unpleasant and pleasant feelings associated with stress. It has been suggested that it is a more appropriate way to measure feelings than a category scale [11]. Although VAS scores varied by subject, they correlated well with state anxiety scores both before and after practicing Ikebana in our study. This indicates that the degree of pleasant or unpleasant feelings was consistent with degree of state anxiety. However, the correlations could not be statistically separated. A negative correlation was obtained and is shown in Figure 3B. The relation of the two values did not change before compared with after practicing Ikebana. In the figure, plots are primarily located in the right lower area before and in the left upper area after practicing Ikebana indicating that state anxiety scores decreased as pleasant feelings increased.

Regarding state anxiety, VAS scores for pleasant feelings after practicing Ikebana in subjects with high trait anxiety were significantly higher than those before practicing Ikebana. In contrast to subjects with high trait anxiety, VAS scores in the low trait anxiety group were not significantly different before compared with after practicing Ikebana. Scores in the high anxiety group after Ikebana approximated scores in the low anxiety group. This indicates that Ikebana was

beneficial in increasing pleasant feelings for subjects with high trait anxiety.

RR and state anxiety

RR decreased after Ikebana as did state anxiety and VAS score. However, there was no significant difference in RR in the low trait anxiety group before compared with after practicing Ikebana. However, RR significantly decreased in the high trait anxiety group, similar to the patterns of state anxiety and VAS scores.

Measurements of RR obtained before practicing Ikebana correlated well with trait anxiety scores. The close relationship between RR and trait anxiety scores has been shown in previous studies [6,7]. RR during quiet breathing significantly decreased after practicing Ikebana in this study. Interestingly, the difference in RR before and after practicing Ikebana was larger in the high trait anxiety group. RR decreased more in the high trait anxiety group than in the low trait anxiety group, and this difference was negatively correlated with trait anxiety scores. A similar response was observed in a study of anticipatory anxiety in which RR increased more in a group with high trait anxiety, and showed a positive correlation with trait anxiety scores [7]. Typically, RR increases when individuals feel negative emotions and it decreases when they feel positive emotions. However, the degree of change in RR is dependent on the level of trait anxiety.

Using functional brain mapping, in our previous study we showed that activities in the amygdala during anticipatory anxiety were synchronized with respiratory rhythm [9]. Animal in vitro experiments using limbic-brainstem-spinal cord preparation showed that spontaneous burst neural activities recorded from the amygdala are synchronized with respiratory activities recorded from the phrenic nerve [13]. Rhythmic burst activities observed in the amygdala, were increased when corticotrophin-releasing factor (a stress substance) was applied to the brain [14].

In this study, we showed that RR during quiet breathing was positively correlated with trait anxiety before practicing Ikebana, although RR after practicing Ikebana was not (Figure 4A). This indicates that practicing Ikebana may be quite effective, especially for individuals with high trait anxiety. This decrease in RR was associated with improvement in the anxiety level. We posit that practicing Ikebana may be a useful method to treat anxiety and stress-related physical symptoms.

In this study, two issues remain unexamined, and thus require further research. First, we did not conduct a follow-up of pleasant/unpleasant feelings and state anxiety associated with a decrease in RR after practicing Ikebana. Therefore, we have no information regarding how long the positive effects of practicing Ikebana remained. According to Spielberger [10], trait anxiety can change if state anxiety is consistently low in everyday life. Engaging in activities such as practicing Ikebana on a regular basis can contribute to decreased trait anxiety, and may also be associated with a decrease in RR and state anxiety in daily life. In future studies, we need to investigate whether the positive effects of practicing Ikebana remain in the long-term.

Second, we only examined the effect of practicing Ikebana on anxiety and RR in healthy subjects. Other types of artistic handwork may also contribute to relaxation and the reduction of mental stress

not only healthy subjects but also in patients with anxiety disorders or panic disorder who suffer from high anxiety. It may be more relevant to see a decrease in anxiety with a slower breathing pattern if we test to compare between controls and such patients.

Based on our study, further research is needed to explore the effect of practicing various types of handwork on anxiety and RR and to compare those findings with results obtained practicing Ikebana. Ikebana is grounded in ancient Buddhist philosophy and has been passed down from generation to generation in Japan. This traditional art of flower arranging has the potential to reduce stress and anxiety. We suggest that this art form possesses factors essential for making it a beneficial form of treatment in contemporary psychotherapy [15,16].

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