

# Effects of the Hand Care Therapy that Used Natural Herb Oil on Autonomic Nervous System against All People Concerned

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## Abstract

Multi-sensory stimulation is beneficial to a wide variety of conditions typical of geriatric patients. Some therapies for elderly people are based on the philosophy that the activities to be carried out will also be stimulating to the senses. On the other hand, the dynamics of the senses plays an important role beyond mere reason and sensibility in people's lives. The hand care therapy that used natural herb oil is the alternative medicine that utilized a plant or its essential oil, which is used in various application scenes. In our past study, the hand care therapy that used natural herb oil demonstrated the effectiveness for elderly people. In this study, we examined influences on psychological condition of the side to treatment on. On the evaluation with question paper, baseline of POMS factor and TMD average were similar to pre-HCT. In post-HCT, T-A, A-H, F and C which were negative factors decreased than pre significantly. The forward factor V did not have significant difference, but the mean increased. Furthermore, the TMD (total mood distance) score generally decreased and changed in the balance of good feelings. On the objective evaluation, temporal change differences in the PNS (Parasympathetic Nervous System) during the relaxed state and following the induced stress state were monitored using ECG (electrocardiograph). The SNS (Sympathetic Nervous System) of students in HCT has decreased, and the PNS was confirmed to increase. For the tendency in SNS, the changes during the HCT were small. There were no significant changes in rSO<sub>2</sub> (regional oxygen saturation) by HCT. BVI (blood volume information) showed significantly big values at left hand treatment and after HCT than BL, indicating that peripheral circulation of the blood flow quantity of the student increased. Generally, it was shown that the subjective emotional evaluation of the hand care treatment side, the

objective autonomic nervous system change, and the coronal blood flow were all good. In Japan, the global pandemic of COVID-19 disrupts human interaction, and there are concerns about physical, cognitive, and mental deterioration. The use of hand care therapy has been shown to be an effective technique for building quality communication for both recipients and performers.

## Keywords

Hand Care Therapy, Para-Sympathetic Nervous System (PNS), Sympathetic Nervous System (SNS), Emotional Health, COVID-19

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## 1. Introduction

Psychogeriatric medical care often takes time. Particularly, the care for person with dementia takes more time. Therefore, not only the care of the psychological conditions of the elderly person, but also the care of the medical person side is important. Multi-sensory stimulation is beneficial to a wide variety of conditions typical of geriatric patients. Changes appeared in muscle tension, skin conductance and pulse that correlates with reduced blood pressure [1] [2]. Various studies of horticultural therapy programs have demonstrated the positive effects on schizophrenic behaviour and those suffering from depression [3]. In other words, engaging in horticultural activities may help improve the stability of the mind and generally facilitate a much broader and more positive attitude.

It has been reported that students participating in horticulture therapy programs developed a greater interest in the welfare of others and that the student's own feelings became more positive [4] [5] [6]. Horticultural therapy is based on the philosophy that the activities to be carried out will also be stimulating to the senses. It is one big characteristic of the horticultural therapy, and it is an advantage [7]. On the other hand, the dynamics of the senses plays an important role beyond mere reason and sensibility in people's lives. The hand care therapy (HCT) included in the horticultural therapy which is the alternative medicine that utilized a plant, or its essential oil is utilized in various application scenes.

In recent studies, the hand care therapy that used natural herb oil demonstrated the effectiveness for the elderly people and showed that it had many good influences on the psychological condition of the side that performs HCT. We want to clarify a mental or psychological effect of HCT [8] [9]. It was intended to exhibit the subjective and objective reaction of HCT.

According to a report from the Philippines, COVID-19 became more severe in cases with a vitamin D concentration of less than 30 ng/mL, whereas it was mostly mild in cases with a vitamin D concentration of 30 ng/mL or more. It was presumed that the risk of dementia progression increases as the new lifestyle of isolation continues [10]. In other words, behavioural restrictions and lack of communication between humans caused by the spread of COVID-19 should be considered to have an adverse effect on various diseases. On the other hand,

utilizing HCT that utilizes the power of nature and plants for the elderly, it was expected to lead to prevention cognitive impairment and behaviour such as depressive views and depressive tendencies by COVID-19 [11] [12]. In addition, behavioural restrictions are due to the spread of COVID-19, while many citizens had a tendency toward depression and ADL reduction due to behavioural restrictions [13] [14]. The adverse effects of these COVID-19 behavioural restrictions have also been reported to worsen the mental state of medical personnel [15]. In this study, we examined how much HCT, which facilitates the construction of high-quality communication, can contribute to the mental stability of the treating side, and considered the importance of HCT dissemination in the COVID-19 prevalence state.

## 2. Material and Methods

### 2.1. Surgical Students and Subjects

Of the 164 students belonging to the Department of Occupational Therapy at University B, 17 were qualified as phytotherapy college-certified hand care therapists and agreed to this study. The elderly in this study lived in A city, with a population of about 160,000, 31.8% of those aged 65 and over and 16.1% of those aged 75 and over, which was the average region in Japan. Seventeen healthy student volunteers (8 male and 9 female; mean age  $21.4 \pm 0.7$  years) were enrolled. The 17 students practiced HCT treatment for the elderly and Before and after the activity, mood evaluation was performed using VAS (visual analog scale) and POMS (Profile of Mood States), and changes over time in ANS (autonomic nervous system),  $rSO_2$  (regional oxygen saturation) and BVI (blood volume information) were measured during HCT practice. The measurement results were tabulated for each work procedure and shown in a graph.

Subjective reaction of surgical operation student of HCT for the elderly entrance person in care health centre was investigated at pre and post HCT. Objective reaction of surgical operation student of HCT for the elderly entrance person was investigated during HCT. The times required for every event were Preparation; 2 - 3 min., Base Line Resting; 3 min., Interval 1; 1 min., Right hand HCT; 5 - 7 min., Interval2; 1 - 2 min., Left hand HCT: 5 - 7 min., Rest after HCT; 3 - 5 min.

### 2.2. Material and Time of Subjective Evaluation, Questionnaire Paper Evaluation and Objective Evaluation

Material and time of subjective evaluation, questionnaire paper evaluation and objective evaluation were shown at **Table 1**.

The subjective evaluation was VAS, the question paper evaluation enforced POMS (Profile of Mood States) and subjective evaluation include ANS and INVOS were included in an objective evaluation.

POMS investigation was used to measure changes in students' moods and emotions [16] [17] [18] [19]. The POMS consists of 65 single-word items rated

**Table 1.** Evaluation methods or aim and material.

	Methods or Aim	Time, Material
Subjective evaluation	VAS (Visual Analog Scale)	Pre & Post of HCT Relax → strain
Questionnaire paper evaluation	POMS (Profile of Mood States)	Pre & Post of HCT
Objective evaluation	Autonomic nervous system measurement	A surgical operation all the time A spectral ECG (Electrocardiogram) was performed using software, MemCalc/Tarawa system (GMS, Japan). The sympathetic nervous system (SNS: LF/HF) has been retracted, the parasympathetic nervous system (PNS: HF) was confirmed to be enhanced.

from 0 (not at all) to 4 (extremely). We compared the results of the POMS tests measuring student's tension-anxiety (T-A), depression-dejection (D), anger-hostility (A-H), vigour-activity (V), fatigue-inertia (F) and confusion-bewilderment (C) before (pre-HT, CT) and after (post HT, CT) HCT. The score of POMS was shown by T score ( $T \text{ score} = 50 + 10 \times (\text{standard score} - \text{average}) / \text{standard deviation}$ ), and total mood distance (TMD method =  $T - A + D + A - H + F + C - V$ ) that showed overall moods and emotions were used. It is shown that feelings are steady when TMD points are low, and if it is at 100 points, it is excellent. POMS reliability and validity is well supported by literature.

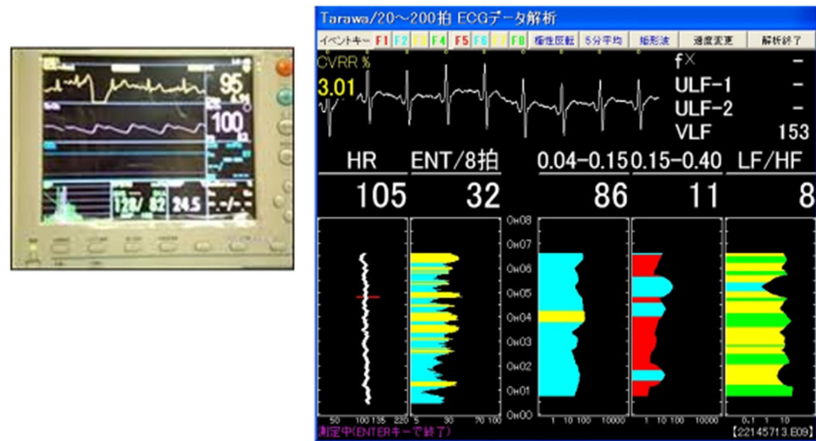
### 2.3. ANS Change Measurement (A Spectral ECG Analysis)

A spectral ECG analysis (heart rate variance: HRV analysis) was performed using software, MemCalc/Tarawa system (GMS, Japan), which is a non-invasive, real-time analysis system [20] [21]. The low-frequency (LF: 0.04 - 0.15 Hz) component reflects sympathetic and parasympathetic modulation, whereas the high-frequency (HF: 0.15 - 0.4 Hz) component mainly reflects parasympathetic modulation. Electrocardiogram (ECG) was measured using a continuous wave frequency spectrum analysis, the sympathetic nervous system (SNS: LF/HF) has been retracted, the parasympathetic nervous system (PNS: HF) was confirmed to be enhanced (Figure 1).

### 2.4. Somatic Oxi-Meter Analysis

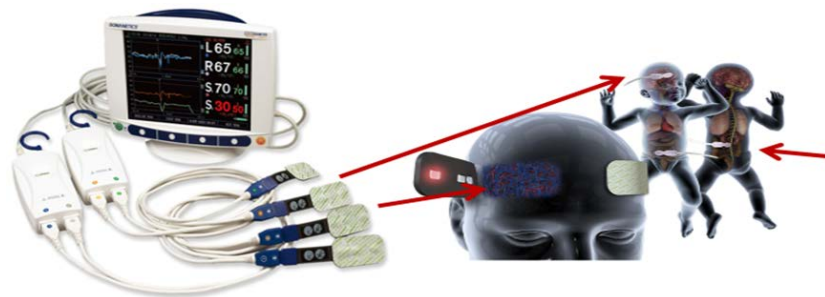
INVOS™ 5100C cerebral/somatic oxi-meter (manufacturer: Medtronic Usa) provides real-time monitoring of site-specific blood oxygen saturation in the brain and other body tissues to help surgical and intensive care teams detect and correct ischemic problems that can lead to complications and poor outcomes (Figure 2) [22] [23].

The original purpose of this medical device: Monitors real-time changes in regional oxygen saturation of blood in the brain or other body tissues beneath the sensor for effective oxygen monitoring in adults, children, infants and neonates, Allows clinicians to measure site-specific oxygen levels rather than requiring



ECG monitor + Mem calc analysis soft (GMS co. Ltd. Mem Calc/Tarawa)

**Figure 1.** A temporal change of the Parasympathetic Nervous System (PNS) of a relaxed state and the Sympathetic Nervous System (SNS) of a strain state was measured using ECG and analysis software (GMS co. Ltd. Mem Calc/Tarawa). \*HF value = PNS, LF/HF value = SNS. LF: 0.04 - 0.15 Hz reflects parasympathetic function and some sympathetic function. HF: 0.15 - 0.4 Hz is related to respiratory and heart rate variability, PNS function almost and that is reflected in the indicators used in the SNS ratio LF/HF.



**Figure 2.** Evaluation with medical equipment studying now INVOS (IN Vivo Optical Spectroscopy).

them to infer the data from systemic, whole-body measures such as blood pressure and pulse oximetry, Available in two or four data channels, the INVOS system conveniently monitors multiple brain and body areas at once. In this study, two sensors are attached to the front face of the student in charge of HCT, and rSO<sub>2</sub> and BVI of the total blood flow 3 cm below the sensors are measured. Then, the change in the practitioner’s emotions was measured.

Mixed blood oxygen saturation during brain bloodstream was inspected with autonomic nerve. No aggression mixture blood oxygen saturation monitoring system rSO<sub>2</sub>; regional oxygen saturation

$$rSO_2 = \frac{O_2Hb \text{ of arterial and venous blood}}{(O_2Hb \text{ of arterial and venous blood}) + (RHb)}$$

### 2.5. Statistical Analysis

Wilcoxon signed rank sum test was used for comparison between two groups for which a normal distribution cannot be assumed (Table 2).

**Table 2.** Changes of students in POMS t and TMD score from baseline and pre & post-HCT activities, (mean  $\pm$  SD).

Answer time	Average t-score of POMS and TMD value (n = 17)						
	T-A	D	A-H	V	F	C	TMD
Base Line	45.3 $\pm$ 8.6	49.0 $\pm$ 8.5	45.1 $\pm$ 6.2	50.7 $\pm$ 5.0	45.4 $\pm$ 5.5	45.3 $\pm$ 8.1	179.1 $\pm$ 17.3
HCT							
Before	46.9 $\pm$ 5.5	51.6 $\pm$ 9.9	46.9 $\pm$ 8.9	50.2 $\pm$ 8.4	45.8 $\pm$ 6.9	45.6 $\pm$ 7.4	186.6 $\pm$ 27.9
After	42.9 $\pm$ 5.8	48.5 $\pm$ 7.7	44.3 $\pm$ 7.2	50.9 $\pm$ 15.6	44.5 $\pm$ 8.6	43.3 $\pm$ 8.1	172.1 $\pm$ 27.4
S.D. (p-Value)	**	*	**	ns	ns	*	**

\*, \*\*: Mean separation within Pre the activities start and Post HCT indicate 0.05 and 0.01 significant differences, respectively. ns: no significant. Base line: 7days before activities.

The results of ANS were shown as mean  $\pm$  SD (min-max), Interquartile range, Median, statistical significance was checked. The One-way analysis of variance, multiple comparisons Tukey tests were performed in Evaluation of various questionnaires.

## 2.6. Ethical Considerations

We strictly observed the Helsinki Declaration of 2015 (revised in 2013), explained the purpose and outline of this study to them and obtained informed consent from them beforehand. All procedures were approved by the Nishi-Kyushu University (Saga, Japan) Ethics Committee (H29-5, 2017).

## 3. Results

### 3.1. Subjective Evaluation

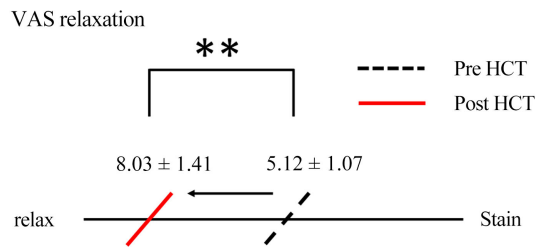
**Figure 3** showed the results of VAS evaluation on subjective feelings of students. The feelings of students became strong in the tendency that could be relaxed clearly by operating for HCT.

### 3.2. Evaluation with Question Paper

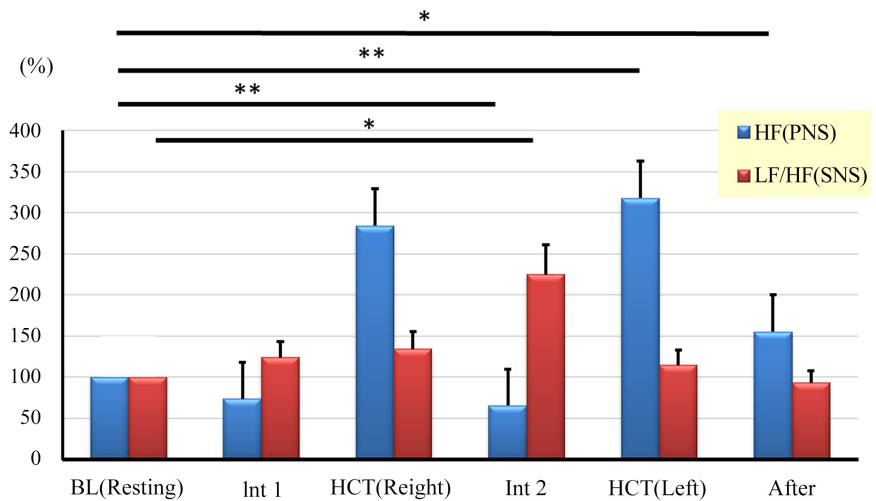
**Table 2** showed the POMS evaluation with questions about the mood state of students. Baseline of POMS factor and TMD average were similar to pre-HCT. In post-HCT, T-A, A-H and C which were negative factors decreased than pre significantly. In addition, F, the negative feelings factor did not have significant difference, but the mean decreased. The forward factor V did not have significant difference, but the mean increased. Furthermore, the TMD score generally decreased and changed in the balance of good feelings.

### 3.3. Objective Evaluation

Temporal change differences in the Parasympathetic Nervous System (PNS) during the relaxed state and following the induced stress state were monitored using electrocardiograph (ECG). The SNS of students in HCT has decreased, and the parasympathetic nervous system (PNS) was confirmed to increase (**Figure 4**).



**Figure 3.** Comparison of VAS (relaxation) before and after HCT on surgical operation person of the student (N = 17). \*\*: Mean separation within Pre the activities start and Post the activities over months indicate 0.01 significant differences, respectively.



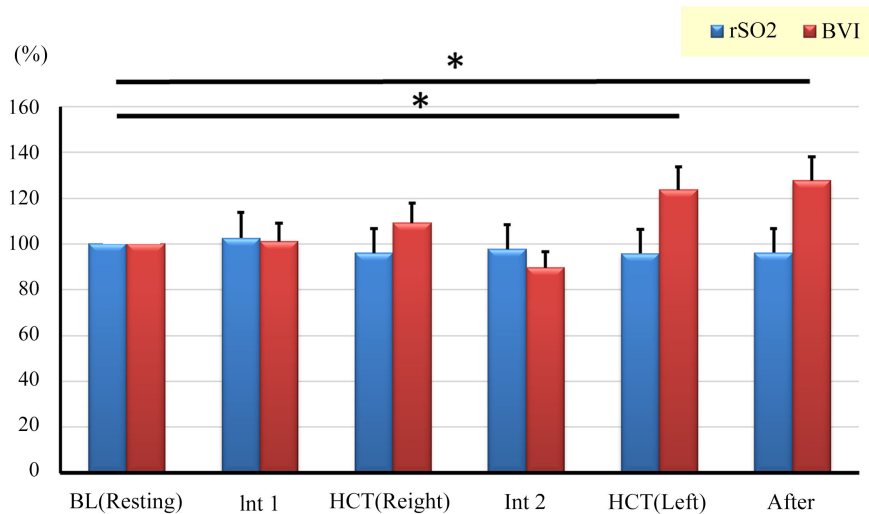
**Figure 4.** Time course of HF (PNS) and LF/HF (SNS) of students on HCT for elderly peoples. N = 17, BL = 100%. The data collection time for each was Preparation; 2 - 3 min., Base Line Resting; 3 min., Interval 1; 1 min., Right hand HCT; 5 min., Interval 2; 1min., Left hand HCT: 5. It was min., Rest after HCT; 3 - 5 min. And statistical comparison was made using their average values. \*, \*\*: Mean separation within Pre the activities start and Post HCT indicate 0.05 and 0.01 significant differences, respectively. Base line: 7 days before activities.

For the tendency in SNS, the changes during the HCT were small. Nevertheless, only at the time of Int2, SNS significantly increased, in comparison with BL. As for this, it was thought that int2 had too short preparation time for the next surgical operation. The PNS significantly increased in comparison with BL at the time of HCT. In addition, an increased trend continued after HCT. It was indicating a bigger effective HCT for student’s relaxation and the feeling of happiness.

There were no significant changes in rSO<sub>2</sub> by HCT. BVI showed significantly big values at Left hand treatment and After HCT than BL, indicating that peripheral circulation of the blood flow quantity of the student increased (Figure 5).

From this, it was estimated that relaxation effects can be obtained by the action of HF (PNS), LF/HF (SNS), rSO<sub>2</sub> and BVI in HCT.





**Figure 5.** Time course of frontal plane rSO<sub>2</sub> and BVI of students on HAM for elderly peoples. N = 17, BL = 100%. The data collection time for each was Preparation; 2 - 3 min., Base Line Resting; 3 min., Interval 1; 1 min., Right hand HCT; 5 min., Interval 2; 1min., Left hand HCT: 5. It was min., Rest after HCT; 3 - 5 min. And statistical comparison was made using their average values. \*, \*\*: Mean separation within Pre the activities start and Post HCT indicate 0.05 and 0.01 significant differences, respectively. Base line: 7 days before activities.

#### 4. Discussion

In general, it became clear that the relaxation effect to a surgical operation person was seen in both subjective evaluation and objective evaluation. This showed that HCT was effective for caregivers such as dementia which long-term medical treatment is necessary.

As HCT technique are utilized at various hospitals, facilities for senior citizens, and facilities for the disabled because they involve a wide range of work activities and tools, and they also offer numerous types of sensory stimulation. In addition, as a result of POMS, the students who performed the treatment were often thanked by the elderly patients who received the treatment, so it was considered that they were able to reconfirm their role and existence value. HCT is a healing technique with the potential of enriching and brings happiness into participant's lives. When implementing HCT at a nursing home as a care technique for elderly persons, it is necessary to understand their usefulness. The benefits of HCT techniques can be observed not only in the area of general therapeutic application, but also in overall positive effects on emotional health of the participants, therapists and all related personnel.

In each country, the effects of the COVID-19 pandemic in people with dementia and those without dementia have been investigated, and the magnitude of the risk of people with dementia being infected with COVID-19 has been stated [24] [25] [26] [27] [28].

Super-aging in Japan, the global pandemic of COVID-19 disrupts human interaction, and there are concerns about physical, cognitive, and mental deterioro-



ration [29] [30] [31] [32]. The use of HCT has been shown to be an effective technique for building quality communication for both recipients and performers. Therefore, it was expected that the widespread use of HCT would promote interaction among all citizens involved in the COVID-19 epidemic and reduce frailty-induced physical and psychological disorders such as decreased brain function.

## 5. Conclusion

From previous studies, it was known that HCT amplifies the subject's sense of well-being. In addition, the conditioning effect of autonomic nervous system and emotional health were expected to the surgical operation person (therapist) of the hand care therapy too. Therefore, it was expected that the widespread use of HCT would promote interaction among all citizens involved in the COVID-19 epidemic and reduce frailty-induced physical and psychological disorders such as decreased brain function.

## Disclaimer

Since this study is the result of one region of Japan, verification in regions with different medical, health, welfare environments and cultures were insufficient. Therefore, it is necessary to continue the research in the future.

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## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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