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The Effects of Anma (Traditional Japanese Massage)—Randomised Trial

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Abstract

Background and Objective: Anma is a traditional Japanese bodywork therapy that has not been widely known and used in the West. There have been only a few Anma studies published in English journals. To study the effect of Anma (traditional Japanese massage) among participants who have neck and shoulder stiffness symptoms (so-called *Katakori*, in Japanese). **Methods:** The study participants consisted of seventy-seven (Study 1), thirteen (Study 2), and twenty (Study 3) adults with "*Katakori*" symptoms. The research design is as follows: (Study1) Randomized, Parallel-Group, Controlled Trial. (Study 2) Crossover Clinical Trial. (Study 3) Randomized, Parallel-Group, Controlled Trial. And we conducted Anma treatment for 45 minutes (Treatment) or rest in lying position for 45 minutes (Control). **Results:** In study 1, the symptom of "*Katakori*" was relieved after Anma treatment in Anma group ($p < 0.001$, effect size (es) *d*: 2.2). There was a significant interaction between the Anma group and the control group ($p < 0.001$). In study 2, MBV significantly increased following Anma treatment. There was a significant interaction between the Anma group and the control group ($p = 0.022$). In study 3, the symptom of "*Katakori*" was relieved after Anma treatment in the treatment group. There were no significant interactions between the groups in VAS and MBV values. **Discussion and Conclusions:** The study demonstrated that Anma therapy decreases "*Katakori*" symptoms while increasing MBV in the shoulder region.

Keywords

Massage Therapy, Acupressure, Musculoskeletal Pain, Visual Analog Scale (VAS), Muscle Blood Volume (MBV), Near-Infrared Spectroscopy (NIRS), Anma, *Katakori*

1. Introduction

Anma is one of the traditional Japanese treatment methods. Anma is similar to massage and shiatsu procedures [1]. Anma has several specific points.

First unlike massage, patients can have Anma therapy with clothes (no need to undress). Second Anma is performed from the central part (trunk) toward the distal part (limbs) (efferent). For example, in the upper limb, knead from the shoulder toward the hand. Third the basics of these hand-based therapies are stroking, kneading, pushing and moving (bending and stretching). At the same time, Anma is a therapy centered on kneading.

Anma is known that mechanically stimulate the human body to cause a biological reaction, improve and maintain health, and treat and prevent diseases. There are few reports of Anma, such as gynecologic condition improvement after gynecological cancer surgery (cervical cancer of the uterus, endometrial cancer, ovarian cancer) [2], or those symptoms of Parkinson's disease Improvement of (muscle rigidity, difficulty in movement, pain and fatigue) [3]. However, randomized controlled trial (RCT) studies of Anma are very few.

On the other hand, many Japanese have Anma therapy who have "*Katakori*" [4].

"*Katakori*" is defined as discomfort or dull pain caused by muscle stiffness around the back of the head and through the shoulders and/or shoulder blades [5] [6].

Many Japanese suffer from a specific feeling, "stiffness" in the shoulders and neck. In other words, those patients often recognize "stiffness" at specific sites which have "dull" or "heavy" [7].

Most of targets of acupuncture, Anma, massage, shiatsu treatment are motor organ diseases with the chief complaint of pain [8] [9] [10] [11]. The main cause of pain are "*Katakori*", low back pain and joint pain accounts for the majority [9] [10]. We often evaluate pain with visual analog scale (VAS) [11] [12] [13].

On the other hand, hemodynamics of muscle blood volume (MBV) is another popular indicator to assess pain, especially, that of motor organ diseases. Hydrogen clearance and near infrared spectroscopy (NIRS) are popular MBV methods [14].

The MBV index can assess MBV [14] [15]. We also reported VAS decrease [16] [17] and MBV increase [16] as an effect of massage therapy against muscle fatigue.

Previous studies used skin thermometers and thermography and they re-

ported that skin temperature increased in the peripheral circulation [18] [19] [20]. However, very few studies evaluated VAS and MBV of Anma [16] [17]. Therefore, in this study we studied the effects of Anma therapy for "*Katakori*" with VAS and MBV by NIRS.

Three studies were conducted to verify the study. In Study 1, we tested the hypothesis that Anma treatment would reduce the "*Katakori*" symptom. In Study 2, we tested the hypothesis that Anma treatment would increase MBV in the shoulder region. In Study 3, we tested the hypothesis that Anma treatment would reduce the "*Katakori*" symptom while increasing MBV in the shoulder region.

2. Methods

2.1. Trial Design

Study 1: Randomized, Parallel-Group, Controlled Trial. Study 2: Crossover Clinical Trial. Study 3: Randomized, Parallel-Group, Controlled Trial.

2.2. Participants

We recruited participants in Tsukuba City, Japan. Recruitment of participants for Studies 1, 2 and 3 was made at the information and posters at the National University Corporation Tsukuba University of Technology.

The eligibility criteria for research subjects were adult males and females (aged 20 - 80) who were having complaints of "*Katakori*" symptoms. The exclusion criteria for the study were as follows: 1) Musculoskeletal problems in the neck, shoulder, and posterior trunk regions with underlying anatomical or neurological conditions (e.g., cervical radiculopathy, adhesive capsulitis, lumbar spondylosis); 2) Gastrointestinal, cardiovascular, or respiratory disorders; 3) Diabetes; 4) Malignant tumor; 5) Pregnant or lactating women; 6) A history of contact dermatitis due to an adhesive tape.

And then, the written consent was obtained.

This study was approved by the National University Corporation Tsukuba University of Technology, Research Ethics Committee (approval date: 2014.10.2). Also, clinical trial registration was performed using the UMIN clinical trial registration system (UMIN trial ID: UMIN000041076).

The number of people from the sample size could not be collected within the recruitment period. I submitted a prior protocol for a grant application but it was not accepted. Due to the budget and schedule, I proceeded with the research as it was.

2.3. Setting

This study was conducted from November 2014 to October 2015. The site was held in the National University Corporation Tsukuba University of Technology.

2.4. Randomization

The subjects of this study are 110 (26 men, 84 women), average age 51.6 ± 10.6

(a)

subjects	n (m, f)	age (yrs)	mean (SD)
details	110 (26, 84)	27 - 75	51.6 (10.6)

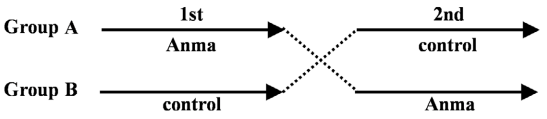
(b)

subjects	n (m, f)	age (yrs)	mean (SD)
control	40 (8, 32)	28 - 75	51.0 (10.2)
Anma	37 (12, 25)	27 - 75	48.9 (11.5)

(c)

subjects	n (m, f)	age (yrs)	mean (SD)
details	13 (3, 10)	40 - 71	56.5 (9.0)

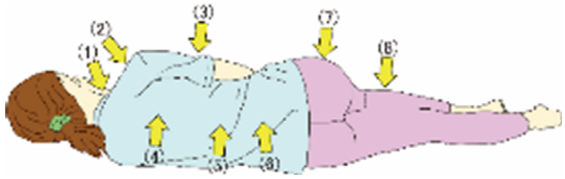
(d)



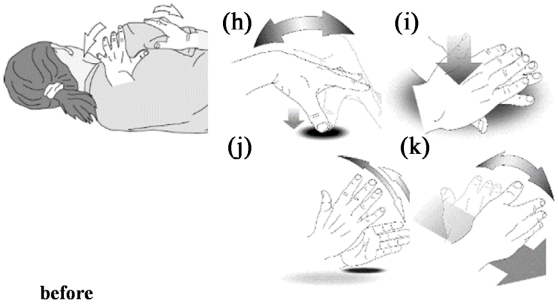
(e)

subjects	n (m, f)	age (yrs)	mean (SD)
control	10 (1, 9)	45 - 68	56.0 (7.2)
Anma	10 (2, 8)	40 - 71	53.4 (9.3)

(f)



(g) **(h)** **(i)** **(j)** **(k)**



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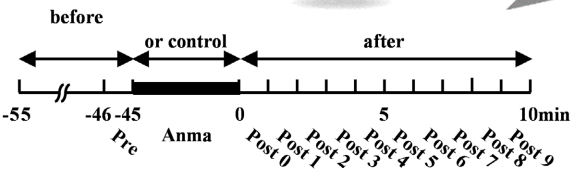

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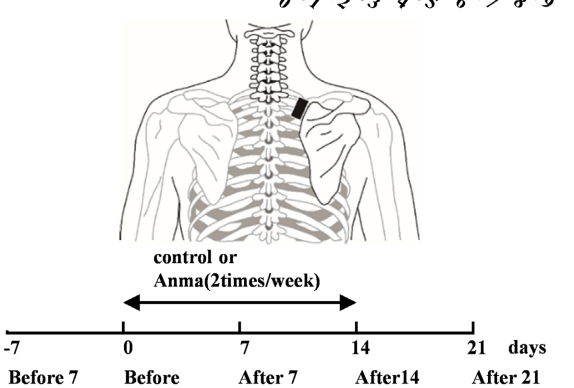

(n)

Figure 1. Illustrated subjects and protocol of this study (a)-(e) Subjects and protocol of this study. (f)-(j) The image of Anma therapy in this study. (k) Kyokude (yokote), a specific Japanese technique. In this study, therapists put the little finger side of their hands on the patients and moved back and forth as illustrated. This technique is also called yokote. (l)-(n) Protocol for measurement of muscle blood volume (MBV).

years (Figures 1(a)-(c)). Allocation of research subjects were assigned by a third person who was not involved in this study and who was concealed with the allocation sequence. In addition, a third party managed until the allocation of each group was completed.

As a result of the recruitment, the subjects of Study 1 were 77 men and women who complained of "*Katakori*", and the grouping was performed by a third party using a computer to generate random numbers, and a group with Anma (Anma group) and a group without Anma (control group). Anma group has 37 people (12 men, 25 women), average age 48.9 ± 11.5 years (27 - 75 years), control group 40 people (8 men, 32 women), average age 51.0 ± 10.2 years (28 - 75 years old) (Figure 1(b)).

The subjects of study 2 were 13 men and women who complain of "*Katakori*" (3 men and 10 women) and ages 40 to 71 years (average age 56.5 ± 9.0 years) (Figure 1(c)). The grouping was performed by randomizing a third person using a computer to perform the Anma treatment (group A) and not perform the Anma treatment (group B). Seven of 13 subjects were subjected to Anma treatment (group A), and 6 were not subjected to Anma treatment (group B). Then, 7 persons who performed in group A were reversed from group B, and 6 persons in group B performed according to the schedule of group A (crossover method) (Figure 1(c), Figure 1(d)).

In the study 3, total number of subjects were 20, who complained of "*Katakori*", and were divided into two groups by the envelope method: a group with an Anma (Anma group) and a group without an Anma (control group). The envelope method was performed using two types of cards (Anma group and control group). Anma group is 10 people (2 men, 8 women), age 40-71 years (average age 53.4 ± 9.3 years), the control group 10 people (1 man, 9 women), age 45 - 68 years (average age 56.0 ± 7.2 years) (Figure 1(e)).

2.5. Blinding (Masking)

The Participants, care providers of the intervention and those assessing outcomes were blind to group assignments. However, the blindness was open to the participants and care providers of the intervention for both Anma treatment and non-treatment.

2.6. Intervention

Anma treatment was conducted by two threrapists (33 years and 35 years of experience) who have Japanese licenses of Anma treatment.

As illustrated the Anma group had Anma therapy; the body position was in the lateral decubitus position (left → right), and the treatment site was performed in the order of (1) cervical portion → (2) upper shoulder region → (3) upper limb → (4) interscapular region → (5) dorsal region → (6) lumbar region → (7) gluteal region → (8) lower limb (Figure 1(f)).

The procedure was illustrated as below (Figures 1(g)-(k)); stroking [g], knead-

ing [h], pushing [i], tapping [j], *Kyokude* (a specific Japanese technique) [k], and stroking [g] were performed in this order for 45 minutes. In the control group, the participants were lying down for 45 minutes.

2.7. Outcome

In study 1, the VAS values of VAS paper (up to 100 mm) separated before and after Amma treatment were used to draw a vertical line before and after Amma treatment to record the "*Katakori*" condition. VAS is 0 mm (no "*Katakori*" feeling) −100 mm (The most terrible state that you can imagine the "*Katakori*" feeling). The VAS values were compared before and after Anma treatment.

In study 2, in the Anma group, 1 minute before the Anma treatment (Pre), immediately after the end of Anma treatment (Post 0), 1 minute later (Post 1), 2 minutes later (Post 2), 3 minutes later (Post 3), 4 minutes later (Post 4), 5 minutes later (Post 5), 6 minutes later (Post 6), 7 minutes later (Post 7), 8 minutes later (Post 8), 9 minutes later (Post 9), the MBV was measured (**Figure 1(l)**). MBV was measured 1 minute before the Anma treatment and 10 minutes after the Anma treatment, and was analyzed by sampling for 5 seconds at each 1 minute interval. In the control group, only the measurement was performed using the same schedule as that of the Anma group.

A tissue StO_2 Hb amount monitor (PSA-IIIN, manufactured by Biomedical Science, Tokyo, Japan) was used for the measurement of MBV. To measure MBV, a measurement probe was mounted at the same height as the inferior margin of the first thoracic spinous process and to the medial edge of the scapula, which is lateral to the right of the posterior median line (**Figure 1(m)**). The dimensions of the measuring probe is 20 × 50 mm, and it is attached with a special double-sided tape.

In study 3, both the Anma group and the control group were 1) 7 days before Anma (Before 7); 2) Immediately before Anma (Before); 3) 7^{th} day after Anma (After 7); 4) Anma after the completion of the implementation (After 14) and the seventh day after the completion of 5) Anma (After 21), a total of 5 measurements were performed (**Figure 1(n)**). As above mentioned, VAS values were measured before Amma treatment, and after resting for 10 minutes in the supine position, MBV was measured for 1 minute and sampled for 5 seconds for analysis. In the control group, only the measurement was performed using the same schedule as that of the Anma group.

The total number of treatments was 4 (2 times/week).

2.8. Study Size

We used an open software "R" (ver.3.6.1), a statistical software, and calculated minimum sample size for Study 1, Study 2, and Study 3.

In study 1, the effect size was $d = 0.4$ (medium of effect size), type I error rate was 0.05, type II error rate was 0.8, and 51 per group. In study 2, the effect size was $f = 0.25$ (medium of effect size), time point was 11 points, type I error rate

was 0.05, Type 2 error rate was 0.8, and 24 per group. In study 3, the effect size was $f = 0.25$ (medium of effect size), time point was 5 points, type I error rate was 0.05, type 2 error rate was 0.8, and 39 per group. Each study recruited participants for the study.

2.9. Statistical Method

In study 1, a two-way analysis of variance was performed using a mixed model for changes in VAS values of the Anma group and the control group. The t-test (Welch's test) was used to compare the course of the two groups before and after the Anma treatment.

In study 2, the validity of the crossover method for MBV of 13 subjects was confirmed by a two-way analysis of variance using a mixed model. In addition, a two-way analysis of variance was performed using a mixed model during the course of MBV among the Anma group and the control group. The course of MBV of the two groups was analyzed by multiple comparison (Bonferroni method) using a mixed model.

In study 3, we performed a two-way analysis of variance using a mixed model during the course of VAS values and MBV of the Anma group and the control group. The course of VAS value and that of MBV of the two groups was analyzed by multiple comparison (Bonnferroni method) using a mixed model. SPSS Advanced Models version 22 was used as the statistical analysis software. The significance threshold was set at 0.05.

3. Results

3.1. Change of VAS Value of Anma Treatment for "*Katakori*" (Study 1)

The VAS value of the Anma group was Post 16.8, 95% CI = [14.0, 19.6] mm ($p < 0.001$, effect size (es) *d*: 2.2), which was lower than the Pre 60.6, 95% confidence interval (95% CI) = [57.0, 64.3] mm. The control group had no change compared to Pre 64.3, 95% CI = [54.4, 74.3] mm. An interaction was shown between the changes in the Anma group and the control group over time ($p < 0.001$, Pre vs Post) (**Figure 2(a)**). That is, the symptoms of "*Katakori*" were improved in the Anma group compared to the control group.

3.2. Changes in MBV of Anma Treatment for "*Katakori*" (Study 2)

The difference in the changes in MBV over time by the crossover method showed no reciprocal interaction between the changes in each group (Anma group and control group), indicating the validity of the data.

MBV of the Anma group were Post 5 172.2, 95% CI = [154.9, 189.5] cm·g/L ($p = 0.02$, es *d*: 0.288), Post 6 173.1, 95% CI = [155.8, 190.3] cm·g/L ($p = 0.011$, es *d*: 0.301), Post 7 174.0, 95% CI = [156.8, 191.1] cm·g/L (0.006, es *d*: 0.314), Post 8 174.8, 95% CI = [157.6, 192.1] cm·g/L ($p = 0.003$, es *d*: 0.326), Post 9 176.0, 95% CI = [159.0, 193.0] cm·g/L ($p = 0.002$, es *d*: 0.344) compared to Pre 151.8, 95% CI = [130.6, 173.0] cm·g/L amount increased MBV. The control group had no

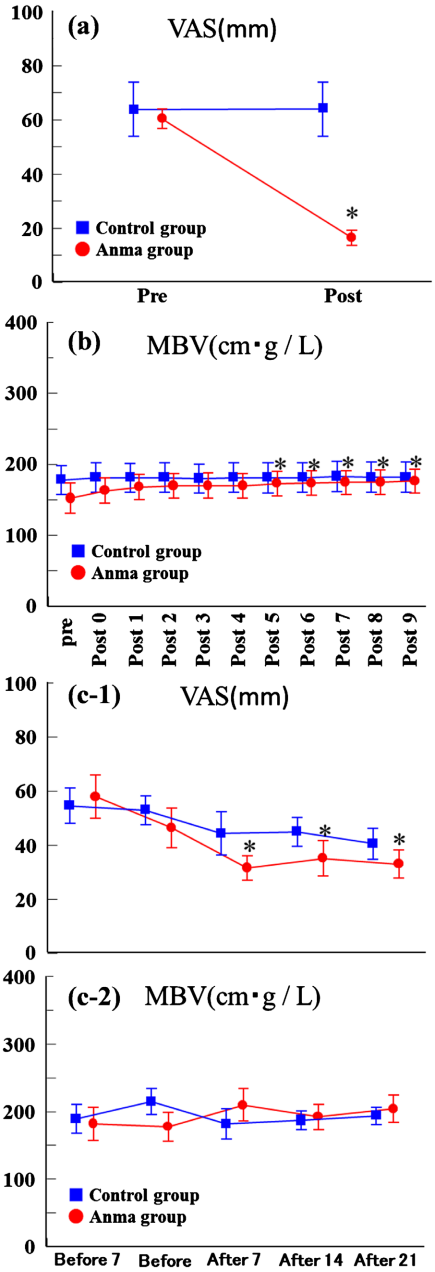

Figure 2. (a) Change of visual analog scale (VAS) value of Anma treatment for "*Katakori*". Mean values and 95% confidence intervals were provided for VAS values before and after each of the Anma and control groups. An interaction was shown between the changes in the Anma group and the control group over time ($p < 0.001$, Pre vs Post). (b) Changes in muscle blood volume (MBV) of Anma treatment for "*Katakori*". Mean and 95% confidence intervals were provided for muscle blood volume (MBV) at 11 time points in each of the Anma and control groups. An interaction was shown between the changes in the Anma group and the control group over time ($p = 0.022$). Differences were obtaine between Pre vs Post 5, Post 6, Post 7, Post 8 and Post 9). (c-1) (c-2) Cumulative effect of VAS value and MBV in Anma treatment for "*Katakori*". Mean and 95% confidence intervals were provided for VAS and muscle blood volume (MBV) at 5 time points in each of the Anma and control groups. VAS values of the Anma group decreased while the control group did not (c-1), Before 7 vs After 7, After 14, and After 21. MBV did not show interaction between the changes in the Anma group and the control group (c-2).

change compared to Pre 176.5, 95% CI = [156.4, 196.7] cm·g/L. An interaction was shown between the changes in the Anma group and the control group over time (p = 0.022, Pre vs Post 5, Post 6, Post 7, Post 8 and Post 9) (**Figure 2(b)**)

3.3. Cumulative Effect of VAS Value and MBV in Anma Treatment for "*Katakori*" (Study 3)

The VAS value of the Anma group decreased After 7 31.2, 95% CI = [26.6, 35.8] mm (p = 0.002, es *d*: 1.294), After 14 34.7, 95% CI = [28.1, 41.3] mm (p = 0.011, es *d*: 0.966) and After 21 32.5, 95% CI = [27.3, 37.7] mm (p = 0.004, es *d*: 1.171) compared to Before 7 57.7, 95% CI = [49.6, 65.8] mm (**Figure 2(c-1)**). Thus differences were obtained between Before 7 vs After 7, After 14, and After 21. The control group was unchanged compared to Before 7 54.3, 95% CI = [47.8, 60.8] mm. There was no interaction between the changes over time in the Anma group and the control group.

MBV did not show interaction between the changes in the Anma group and the control group (**Figure 2(c-2)**).

4. Discussion

The present study showed an increase in MBV and a decrease in VAS value after Anma treatment for "*Katakori*". The VAS value of the "*Katakori*" had an interaction with the group without Anma.

At that time, there was an interaction with MBV during the change over time of the group without Anma. It is considered to be due to a temporary improvement in MBV after Anma treatment, which alleviated the symptoms of "*Katakori*".

In addition, there was no difference in the change over time in MBV in the cumulative effect of Anma. Moreover, the cumulative effect of VAS on "*Katakori*" was improved compared to before the Anma treatment.

It was considered that the effect of Anma was to temporarily improve the MBV after the Anma treatment, and to continue to relieve the symptoms of "*Katakori*" by continuing the Anma.

Suoh S, *et al.* [21] reported that the improvement of shoulder joint excursion in Parkinson's disease after the Anma treatment led to a continuous effect. Therefore, subjective improvement in "*Katakori*" might lead to continuous improvement. Moreover, the authors previously reported an increase in MBV as a result of massaging muscle fatigue [16]. We also reported that the VAS value has decreased [16] [17].

Improvement of the subjective symptoms of this "*Katakori*" is the improvement of the subjective physical upset after gynecological cancer surgery (cervical cancer of the uterus, endometrial cancer, ovarian cancer) [2], symptoms of Parkinson's disease Subjective improvement of (muscle rigidity, difficulty in movement, pain and fatigue) [3] and we also consider similar improvement of subjective symptoms. However, randomized controlled trial (RCT) of Anma is limited, further studies must be needed.

Changes in peripheral circulation due to mechanical stimulation have been clarified to be due to autonomic nervous function response, and is known as the somatic-autonomic nerve reflex [22]. Anma is thought to cause autonomic nervous function response by stimulating the mechanical receptors of the skin by apply pressure or rub to the skin.

Furthermore, we believe that the relief of "*Katakori*" in Anma may interfere with the process by which the stimulation of Anma recognizes the feeling of "stiffness" in the central nervous system. Such effect was reported to be due to control similar to the gate control theory by Melzack R, Wall PD. [23], and we have the same recognition as Doehring KM. [24].

The painful nature of the feeling of "stiffness" is expressed by the adjectives of pain, heavy and pressing. The pain sensation is controlled by the feeling of Anma's sensation rather than the feeling of "*Katakori*" in the gate of spinal dorsal horn, and I think that alleviation of "*Katakori*" symptoms may have occurred.

Furthermore, an increase in oxytocin has been reported in massage stimulation, which is one of the mechanical stimulations caused by skin stimulation [25]. Acupuncture, which is one of the mechanical stimuli by skin stimulation, is known to affect changes in oxytocin secretion, and that acupuncture controls the descending inhibitory mechanism [26].

From this point, we may consider that the stimulation of the skin by the mechanical stimulation may act as one factor that reduces the excitement of pain by the abrasion of the mechanical stimulation.

Anma may transiently relieve symptoms and improve MBV, and mechanical stimulation thinking that intervention can be expected to the central nervous system (brain stem and spinal cord).

In addition, in the problem that there is a difference between the power analysis and the number of subjects, we showed a large effect size for VAS of "*Katakori*" and a medium effect size for MBV.

In Anma treatment, it was considered that the reaction could occur with a high probability, not the reaction that happened by chance. However, in Study 1, Study 2, and Study 3, the control group had less power (Type II error). Its reason might be found that in the difference after intervention in the control group.

Studies 1 and 2 showed an interaction between the Anma group and the control group.

Our results may indicate that Anma treatment will be effective for those who feel "*Katakori*" or for those who feel "stiffness".

The limitations of this study were that the symptoms of "*Katakori*" were alleviated with the change in MBV. Confirmation of histological changes due to the dorsal horn level of the spinal cord and changes in oxytocin due to blood components are not being conducted in parallel. Future research is needed.

5. Conclusion

We conducted three experiments to study if Anma for "*Katakori*" is effective or

not. Our results showed Improvement of VAS value, transient increase of MBV and cumulative effect of VAS value/MBV. They support our hypothesis. Anma for "*Katakori*" could relieve the symptoms of "*Katakori*" and have an immediate effect on increasing MBV.

Acknowledgements

We thank Anma practitioner and all participants.

Authors' Contribution

HK conceived the study. HM designed the experimental protocol. TM, TW, ET and HM performed the experiments and collected the data, HK, TM and ET analysed the data. HM, HK, TW, MW and THT interpreted the results. HM, HK, MW and THT drafted the manuscript. All authors critically edited drafts and approved the final version of the manuscript for publication.t

Conflicts of Interest

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

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