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Acupuncture as a Therapy for Headache

Sumire Chiku and Yasushi Shibata

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Abstract

Acupuncture has been used to treat various diseases, and there are many reports from various countries around the world as a therapy for headaches. Acupuncture has been used to relieve tension-type headaches and prevent migraine attacks. In patients with migraine without aura, the number of headache attacks and analgesic use among patients who received acupuncture was significantly decreased compared to those who were treated with flunarizine. However, few articles have classified headaches in detail and examined the effectiveness of acupuncture. Thus, there is no clear evidence of the types of headache for which acupuncture is effective or whether acupuncture should be performed in the attack phase or intermittent phase. Functional MRI (fMRI) is a form of objective imaging study. Recently, a study was performed to investigate brain dysfunction in patients with migraine and chronic tension-type headache. In the study of the pain-induced activation of fMRI, migraine patients demonstrated specific brain activation in the interictal period compared to controls. We hypothesize that acupuncture affects not only peripheral circulation, but also central nervous function. However, few scientific studies have investigated the effects of acupuncture for headache by assessing cerebral function.

Keywords: headache, acupuncture, acupoint, tension-type headache, migraine

1. Introduction

Headache is prevalent worldwide and was reported as the sixth most frequent global cause of years lived with disability in 2013 [1]. When limited to migraine, its frequency is 19th place, and when limited to women, its frequency is 12th place [2]. The prevalence rate of tension-type headache is also high, and it was reported to be 38% in worldwide [3]. However, the diagnosis of tension-type headache depends on the diagnostic criteria and method. As such, the actual prevalence of patients with headache may be much higher than believed.

2. Basic concept of traditional Oriental medicine

Traditional Oriental medicine is based on “Yin” and “Yang” and the “Five Elements Theory” [4, 5]. “Yin” and “Yang” are mutually opposed, representing related aspects of objects and ideas, such as male and female, right and left, and morning and evening. The Five Elements Theory describes five elements: wood, fire, earth, metal, and water, with everything in the world belonging to one of these five elements. For example, the liver, heart, spleen, lungs, and kidneys fall under the elements of wood, fire, earth, metal, and water, respectively. Of note, the liver and heart in Oriental medicine are not the same as the liver and heart as understood in Western medicine; the liver controls the systemic blood flow and Qi. Qi is a transmutable energy in traditional Chinese medicine that is presumed to flow through 12 meridians in the body [6]. Functional damage to the liver subsequently induces headache and vertigo. The heart controls mental activity, such as memory and intelligence, as well as the tongue; therefore, heart dysfunction can cause taste and language dysfunction. The spleen controls the digestion and absorption of food from the stomach, so spleen dysfunction induces stomachache and diarrhea. The lungs control breathing, and the skin is a barrier against external chemicals and infection. Therefore, lung dysfunction results in catching a cold and respiratory dysfunction. The kidneys control vitality and are related to the ears, so kidney dysfunction can cause a number of diseases, chills, and hearing loss.

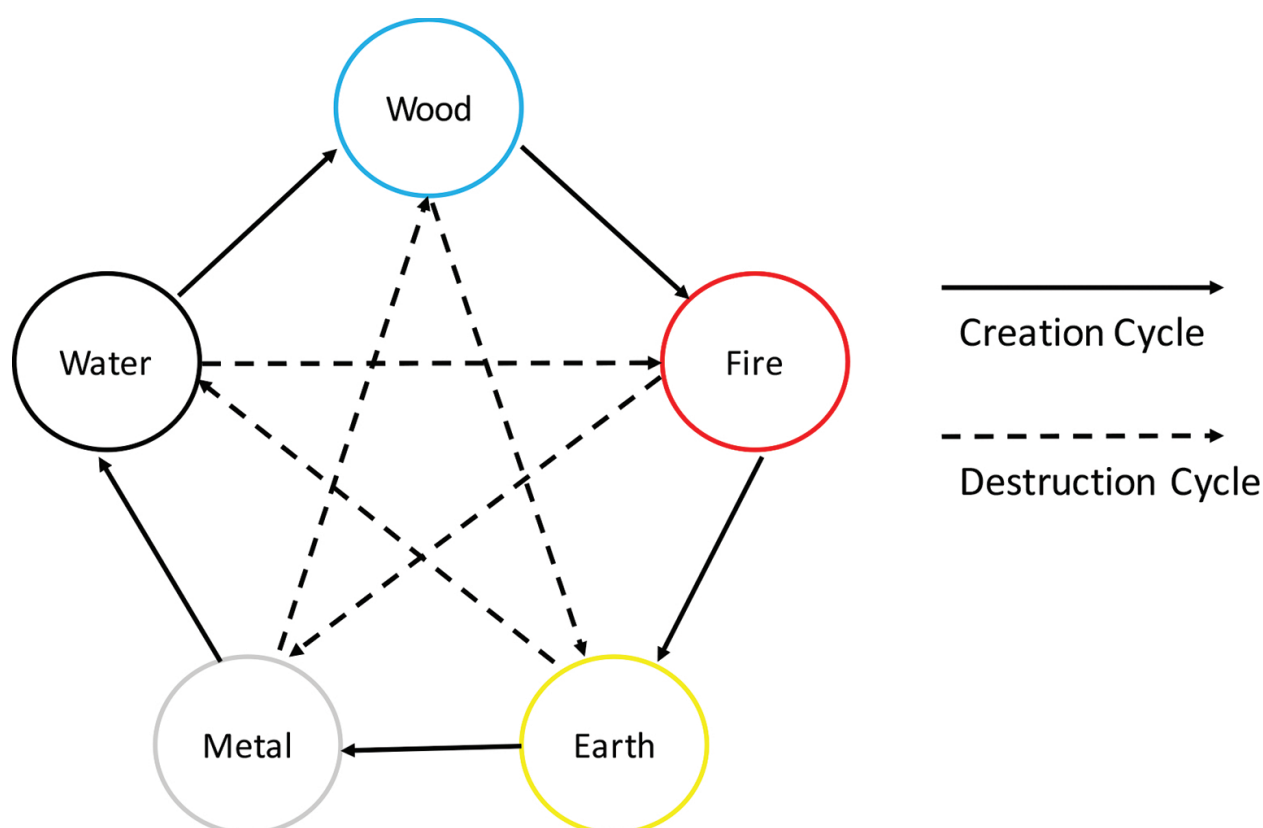


Figure 1. “Creation cycle” and “destruction cycle” (this figure is originally created by authors).

Additionally, the Five Elements Theory includes two relationships: the “creation cycle” and “destruction cycle” (**Figure 1**). The creation cycle is the “mother–child relationship,” which repeats in circulation, and the destruction cycle occurs when one of the five elements wins against or limits another element [4]. Oriental medicine applies this theory for medical treatment and diagnosis. By maintaining balanced creation and destruction cycles, we can maintain good health. If those relationships become unbalanced, acupuncture and Chinese medicine are used to restore the balance.

3. The use of acupoints as a therapy for headache

Acupuncture has been used to treat various diseases, and there are many reports, from various countries around the world, on the use of acupuncture as a therapy for headaches. Acupuncture has been used to relieve tension-type headaches and prevent migraine attacks.

Finger cun (F-cun)	
1 F-cun	Thumb measurement: The width of the interphalangeal joint of the thumb is taken as 1 F-cun The distance between the ends of the two radial creases of the interphalangeal joints of the middle finger is taken as 1 F-cun when the thumb and the middle finger are flexed to form a circle
3 F-cun	Finger width measurement: when the index, middle, ring, and little fingers of the subject are extended and closed together, the width of the four fingers on the dorsal crease of the proximal interphalangeal joint of the middle finger is taken as 3 F-cun

Table 1. The finger-cun measurement methods (this table is originally created by authors based on Ref. [7]).

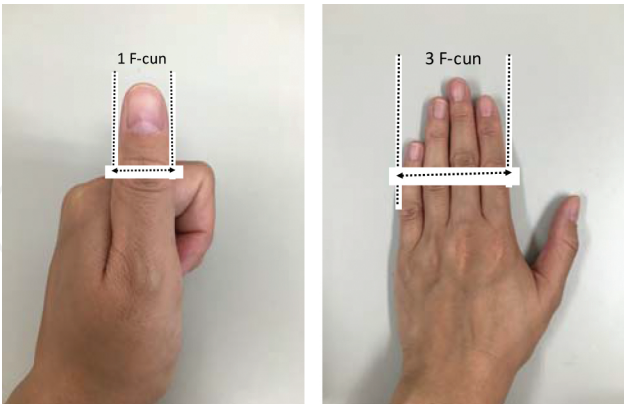


Figure 2. F-cun (this figure is originally created by authors).

Acupoints are determined using one of three typical methods [7]. The first is proportional bone (skeletal) cun (B-cun); this method divides the height of the human body into 75 equal units. Using joints on the surface of the body as the primary landmarks, the length and width of every body part are measured by such proportions [7]. Specifically, we divide the height of the

human body into 75 equal units and then estimate the length and width of certain parts of the body based on such units. One unit is equal to 1 cun. B-cun is the most accurate method, as it measures each person's physical length, but it is complex. As such, other measurements are often used for convenience [7, 8] (**Table 1**). The second method is finger cun (F-cun), which uses a person's finger width to determine the acupuncture points (**Figure 2**). One B-cun and 1 F-cun are almost the same length. F-cun is determined using two methods. The first is thumb measurement using the width of the interphalangeal joints. Another is middle-finger cun (**Figure 3**). Middle-finger cun is the distance between the ends of the two radial creases of the interphalangeal joints of the middle finger is taken as 1 F-cun when the thumb and the middle finger are flexed to form a circle [7]. The last method is finger breadth, which uses the width of the distal phalanx of the middle finger to determine the acupuncture points (**Figure 4**). This method should not be confused with the middle finger cun. This method is rarely used. Given that all of these methods result in some degree of variation in acupuncture point determination.

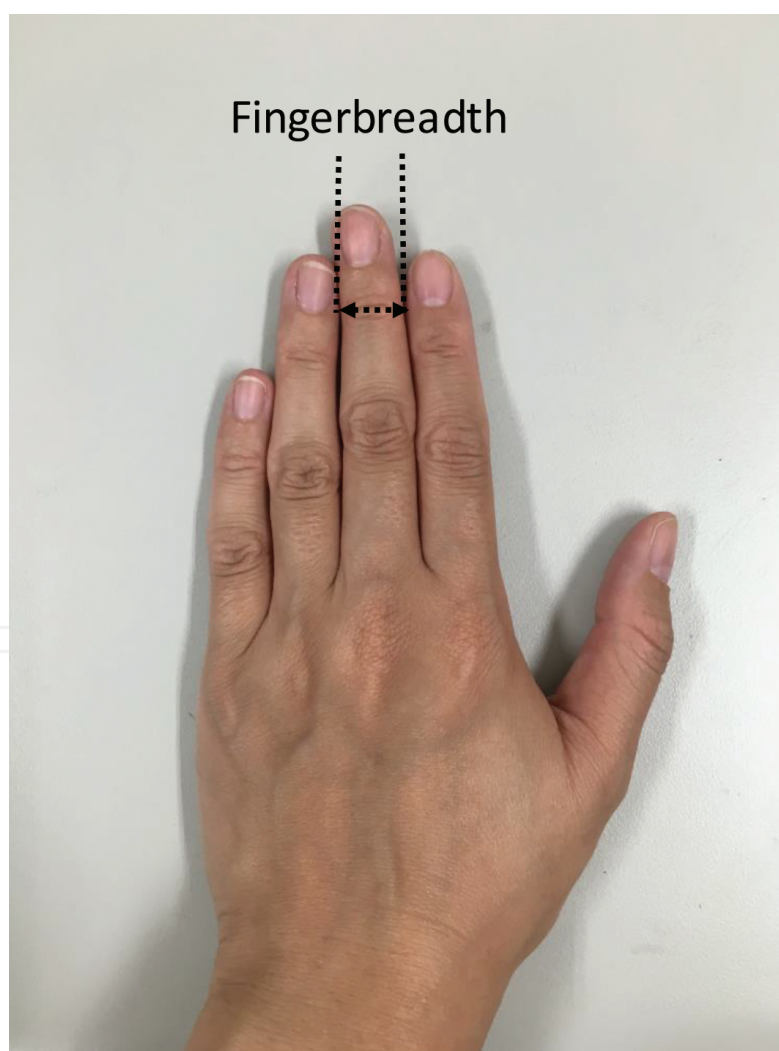


Figure 3. Middle-finger cun (this figure is originally created by authors).

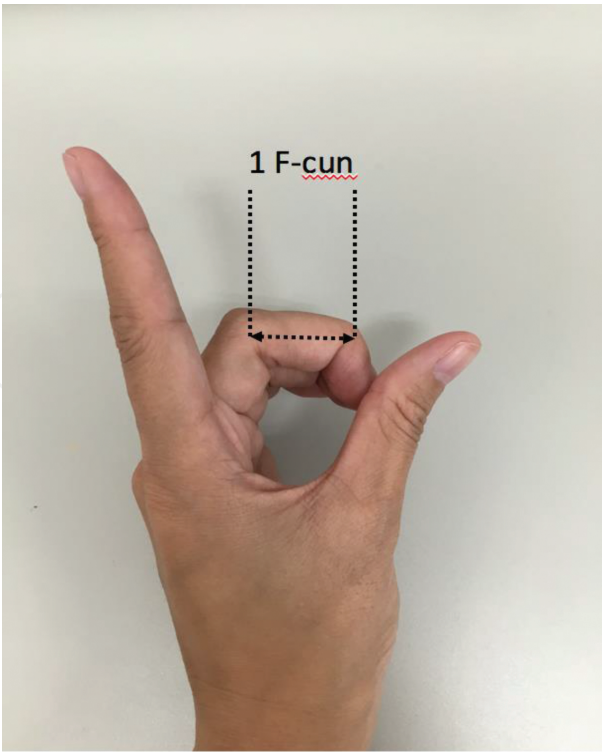


Figure 4. Finger breadth (this figure is originally created by authors).

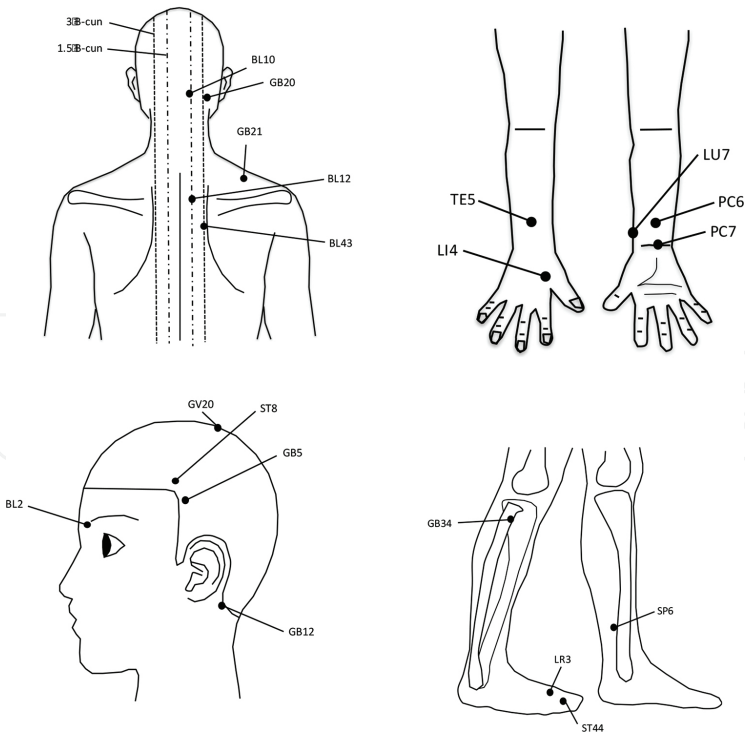


Figure 5. The acupoints used for the treatment of headache (this figure is originally created by authors based on Ref [9, 10]).

English name	Chinese name	Locations
<i>Head region</i>		
BL2	Cuanzhu	On the head, in the depression at the medial end of the eyebrow
GV20	Baihui	When the ears are folded, GV20 is located at the midpoint of the connecting line between the auricular apices
ST8	Touwei	On the head, 0.5 B-cun directly superior to the anterior hairline at the corner of the forehead, 4.5 B-cun lateral to the anterior median line
GB5	Xuanlu	On the head, at the midpoint of the curved line from ST8 to GB7 (on the head, at the junction of the vertical line of the posterior border of the temple hairline and the horizontal line of the apex of auricle)
GB12	Wangu	In the anterior region of the neck, in the depression posteroinferior to the mastoid process
<i>Neck and back regions</i>		
BL10	Tianzhu	In the posterior region of the neck, at the same level as the superior border of the spinous process of the second cervical vertebra (C2), in the depression lateral to the trapezius muscle
GB20	Fengchi	In the anterior region of the neck, inferior to the occipital bone, in the depression between the origins of sternocleidomastoid and the trapezius muscles
BL43	Gaohuang	In the upper back region, at the same level as the inferior border of the spinous process of the fourth vertebra (T4), 3 B-cun lateral to the posterior median line
GB21	Jianjing	In the posterior region of the neck, at the midpoint of the line connecting the spinous process of the seventh cervical vertebra (C7) with the lateral end of the acromion
BL12	Fengmen	In the upper back region, at the same level as the inferior border of the spinous process of the second thoracic vertebra (T2), 1.5 B-cun lateral to the posterior median line
<i>Upper limbs</i>		
LI4	Hegu	On the dorsum of the hand, radial to the midpoint of the second metacarpal bone
PC6	Neiguan	On the anterior aspect of the forearm, between the tendons of the Palmaris, longus and the flexor carpi radialis, 2 B-cun proximal to the wrist crease
TE5	Waiguan	On the posterior aspect of the forearm, midpoint of the interosseous space between the radius and the ulna, 2 B-cun proximal to the dorsal wrist crease
PC7	Daling	On the anterior aspect of the wrist, between the tendons of Palmaris longus and the flexor carpi radialis, on the palmar wrist crease
LU7	Lieque	On the radial aspect of the forearm, between the tendons of the abductor pollicis longus and the extensor pollicis brevis muscles, in the groove for the abductor pollicis longus tendon, 1.5 B-cun superior to the palmar wrist
<i>Lower limbs</i>		
SP6	Sanyinjiao	On the tibial aspect of the leg, posterior to the medial border of the tibia, 3 B-cun superior to the prominence of the medial malleolus

English name	Chinese name	Locations
LR3	Taichong	On the dorsum of the foot, between the first and second metatarsal bones, in the depression distal to the junction of the bases of the two bones, over the distals pedis artery
ST44	Neiting	On the dorsum of the foot, between the second and third toes, posterior to the web margin, at the border between the red and white flesh
GB34	Yanglingquan	On the fibular aspect of the leg, in the depression anterior and distal to the head of the fibula

Table 2. Acupuncture point locations (this table is originally created by authors based on Ref. [7]).

The acupoints used for the treatment of headaches are located on the upper trapezius muscle, the splenius muscle, the semispinal muscle, the levator scapulae muscle, and the rhomboids muscle. These include the bladder meridian, BL10; the gallbladder meridian, GB20, GB12, GB21, and BL43 and acupoints in the trigeminal regions, GB4, GB5, and GB6; the stomach meridian, ST8, ST6, and ST and the peripheral limbs; the large intestine meridian, LI4; the liver meridian, LR3; and the triple energizer meridian, TE5, GB34, and others (**Figure 5, Table 2**) [7, 9, 10]. The acupoints in the neck and back regions are suitable for electro-acupuncture (EA).

4. Reports of acupuncture as a therapy for headaches

In patients with migraine without aura, the number of headache attacks and analgesic use among patients who received acupuncture were significantly decreased in comparison with those who were treated with flunarizine [11].

Kikuchi et al. reported the effects of acupuncture on headache. They examined the numbers of medication days and headache days using a headache diary and found that the number of days in patients who experienced migraines, chronic tension-type headache, medication overuse headache, and chronic migraines decreased by 75, 50, 30, and 20%, respectively [12].

Thus, the effects of acupuncture differed according to the diagnosis. Yamaguchi et al. evaluated the effects of acupuncture in patients with tension-type headache using plethysmography, electromyography, and thermography [13]. Acupuncture was found to be effective for treating headaches because it normalized the excess tension of the neck and upper shoulder muscles rather than the head muscles [13]. However, few articles have classified headaches in detail and examined the effectiveness of acupuncture. Thus, there is no clear evidence of the types of headache for which acupuncture is effective or whether acupuncture should be performed in the attack phase or intermittent phase. Acupuncture therapy is classified as a Grade B treatment in the Japanese clinical practice guideline for chronic headache, which was published by the Japanese Society of Neurology and Headache in 2013 [14].

A Cochrane review reported that there was no significant difference in the clinical effects of true acupuncture and sham acupuncture, but that the number of headache days was decreased

by the intervention [15]. Acupuncture was reported to be more effective and to be associated with fewer side effects than preventive medications [9].

A large clinical study of acupuncture for headache was conducted in the European Union. The number of headache days at 3 months after acupuncture significantly decreased from 8.4 to 4.7 days in the acupuncture group, while it decreased from 8.1 to 7.5 days in controls. In the economic study, acupuncture improved the quality of life and was highly cost-effective [16]. The placebo effect of acupuncture, however, is reported to be nearly 40% [17]. The accurate effect should be verified by a double-blind controlled trial, but it is difficult to establish control groups in acupuncture studies.

Acupuncture studies are associated with another problem with regard to the reproducibility of the treatment. In most reports, acupuncture was performed by an experienced acupuncturist; however, many parts depend on the technique of operator.

The accurate effect should be verified by a double-blind controlled trial, but it is difficult to establish control groups in acupuncture studies. So, some studies have used objective assessments. Chassot et al. reported a crossover trial regarding the effect of electro-acupuncture (EA) on chronic tension-type headache, including an assessment using a biological sample [17]. The visual analog scale score decreased more than 50% following EA in nine patients, but it also decreased in the sham period for five patients. The serum brain-derived neurotrophic factor was inversely correlated with pain intensity and degree of depression.

Kinfe et al. recently reported that presurgical acupuncture predict the effect of surgical occipital nerve stimulation (ONS) [18]. Twelve patients with chronic refractory headache syndrome eligible for ONS were treated using EA (100 Hz, 30 min) before ONS. For EA, four needles were inserted subcutaneously at the level of C1, defined as 3 cm below the occipital protuberance, 1.5 cm bilateral from the midline (two needles), and 3.5 cm bilateral from the midline (two needles), to ensure that it reached the occipital afferent distribution area [18]. The results showed that surgically implanted ONS was effective in some patients who had previously been non-responsive to acupuncture. Acupuncture may be a useful new tool for presurgical assessment.

5. Imaging studies of acupuncture for the treatment of headaches

Some recent reports have assessed the objective effects as well as the subjective effects of acupuncture in the treatment of headaches. Quirico et al. reported that acupuncture altered the cerebral blood flow [19]. The mean cerebral blood flow was changed by the acupoints.

Functional MRI (fMRI) is a form of objective imaging study. Recently, a study was performed to investigate brain dysfunction in patients with migraine and chronic tension-type headache [20]. In the study of the pain-induced activation of fMRI, migraine patients demonstrated specific brain activation in the interictal period in comparison with controls. The regions that were activated included the temporal pole, the parahippocampal gyrus, anterior cingulate cortex, lentiform nuclei, fusiform gyrus, subthalamic nucleus, hippocampus, middle cingulate

cortex, somatosensory cortex, and the dorsolateral prefrontal cortex. Decreased activation was observed at the secondary somatosensory cortex, precentral gyrus, superior temporal gyrus, and the brainstem. The findings differed in the interictal, ictal, and preictal phases. Many fMRI studies have suggested the imbalance of the facilitation and inhibition of the pain signal conduction effect hypersensitivity in migraine.

In Japan, Yamaguchi et al. reported a change in the cerebral blood flow in migraine patients before and after acupuncture using arterial spin-labeled MRI [21]. Before acupuncture, the cerebral blood flow in migraine patients was high in the occipital and right temporal lobes and low at the left temporal and parietal lobes in comparison with controls. After acupuncture, a specific increase was observed in the cerebral blood flow of the thalamus, hypothalamus, pars opercularis, and insula of migraine patients.

Li et al. treated patients with migraine without aura with standard acupuncture five times per week during a 4-week period and examined the pain score and resting-state fMRI [22]. Patients with migraine without aura were found to have decreased functional connectivity in the left precentral gyrus, postcentral gyrus, left supramarginal gyrus, and the lower left parietal lobe. Furthermore, they found that the decreases in these functions were improved by the acupuncture therapy.

We hypothesize that acupuncture affects not only peripheral circulation, but also central nervous function. However, few scientific studies have investigated the effects of acupuncture for headache by assessing cerebral function. In the future, an objective clinical study assessing the effect of acupuncture on headache should be conducted.

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