Activation of Cerebral Cortex in Various Regions After Using Kinesio Tape

Akio Mori
Masaki Takasaki

Professor, Nihon University

The change in the action of the cerebral cortex when using Kinesio Tape has been examined previously using the somatosensory evoked potentials (SEP) after electrically stimulating the posterior tibial nerve in the ankle by applying Kinesio tape to the planta pedis as an index, and it was found that the use of Kinesio Tape increased the amount of information transmitted from the periphery and increased recognition of the movement by the subject. In addition, what change occurs in various frequency bands of brain waves associated with the appearance of SEP was examined, and consequently, the possibility that application of Kinesio Tape increases the excitability of the cerebral cortex to induce the output of exercise was suggested.

At the present time, we clarified how the excitability of the cerebral cortex was activated after stretching the wrist using a 128-channel electrode.

The subjects were 5 healthy male volunteers (aged 21 to 23 years).

Stretching of the wrist was conducted voluntarily 10 times at about 1- second intervals with and without the use of Kinesio Tape.

Figure 1 shows the position of electrode recording at 128 sites on the scalp.

Photograph 1 shows a device used to determine the position of electrodes for brain wave and attachment of electrode.

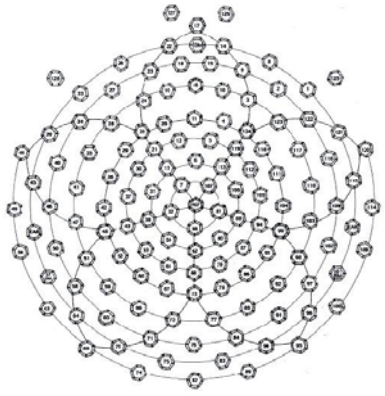
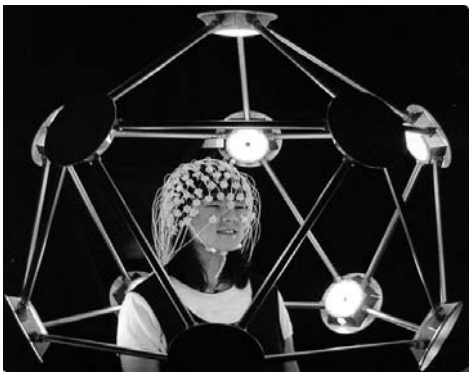


Figure 1. Position of electrode recording at 128 sites on the scalp. The upper side shows the frontal region.



Photograph 1. Attachment of 128-Ch electrode and a device to detect the position of electrode (Photogrammetry).

Brain waves were recorded at the upper cutoff frequency of 200 Hz, the lower cutoff frequency of 0.1 Hz and the sampling frequency of 500 Hz using EGI digital electroencephalograph (EGI system 200). Resistance between the electrode and the scalp was set at below 100 kΩ. The recorded brain wave was treated with FFT (fast Fourier transform) using the brain wave analysis software EMSE Suite (Source Signal Imaging) to extract the brain wave in the β-wave band. The β-wave was divided into β1 (13 to 20 Hz) and β2 (20 to 30 Hz) to determine the distribution of brain potential. The distribution of brain waves was examined by synthesizing with the three-dimensional model prepared from the MRI image in advance.

Figure 2 shows the position of 128-point electrode on the MRI image with black spots.

Figure 3 shows the association area, the visual area, the motor area and the somatosensory area on the surface of cerebral cortex of the left brain.

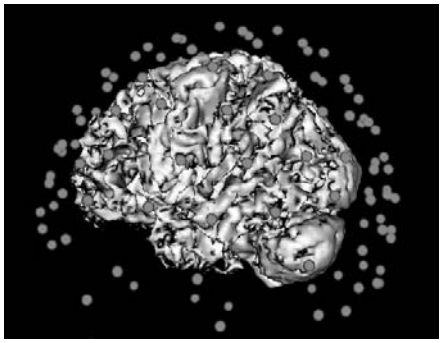


Figure 2. Positional relationship between the 3D model of MRI and the electrode on the left brain

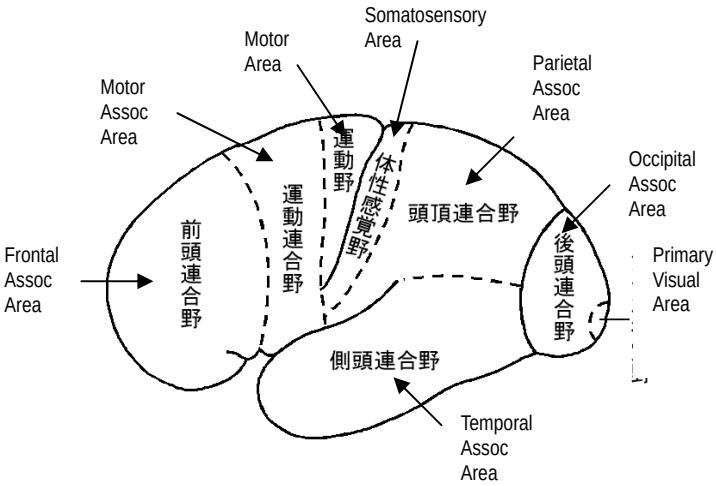
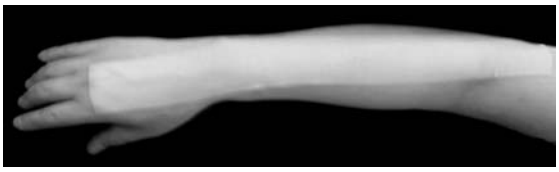


Figure 3. Motor area, somatosensory area, visual area and association area in the left cerebral cortex



Photograph 2. Attachment of KinesioTape to the right forearm

Photograph 2 shows attachment of Kinesio Tape of 2.5 cm in width and 17 cm in length from the right forearm to the wrist.

Figure 4 shows the distribution of active potentials in the β-wave band (13 to 30 Hz) in the cerebral cortex after repeated stretching of the right wrist in the control (eye-opening at rest), without the use of Kinesio Tape and with the use of Kinesio Tape. As shown in both images seen from the parietal region, the action of potential highly increased after using Kinesio Tape.

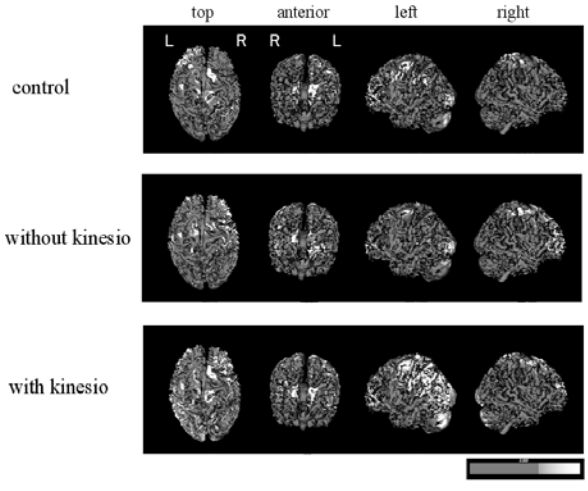


Figure 4. Distribution of brain potential in the β-wave band after repeated stretching of the wrist before and after the use of Kinesio Tape and without the use of Kinesio Tape. The white region shows high activity.

The activity in the prefrontal area seen from the frontal plane after repeated stretching of the wrist after the use of Kinesio Tape was higher than that without the use of Kinesio Tape. In the right and left cerebral cortex, activity in the parietal association area and the motor area in the left brain was highly increased.

Figure 5 shows the FFT-treated β-wave band (13 to 30 Hz). The motor area and the parietal association area with the use of Kinesio Tape showed high peak values in a markedly slow frequency band (near 13 Hz). The prefrontal area also showed a high peak value at near 13 Hz. Based on the above, β1, the β wave of a slower frequency showed a characteristic change in the action in the brain after the use of Kinesio Tape. Particularly, activity of the parietal association area related to the spatial relationship of the left brain, the somatosensory area, and the motor area was increased.

The reason for such an increase in the activity of the cerebral cortex is believed to be because the sensory information from the skin area using Kinesio Tape is strongly involved.

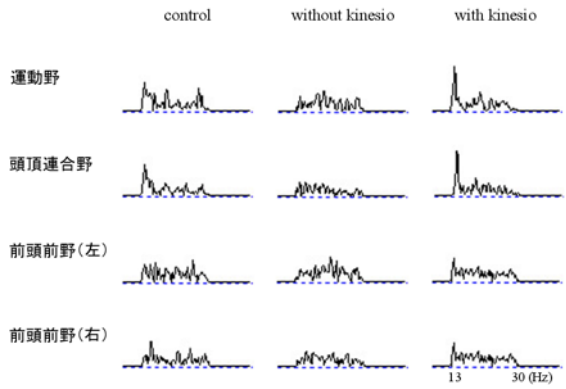


Figure 5. FFT (13 to 30 Hz)-treated waveforms in the motor area, parietal association area and prefrontal area after repeated stretching of the wrist before and after the use of Kinesio Tape and without the use of Kinesio Tape.

As shown in Figure 6, the sensory information is believed to have influence on the output system from the motor area of the cerebral cortex. The information from the sensory area to the motor area, parietal association area and prefrontal area is possibly affected by the cortex-cortex projection system from the second layer and the third layer.

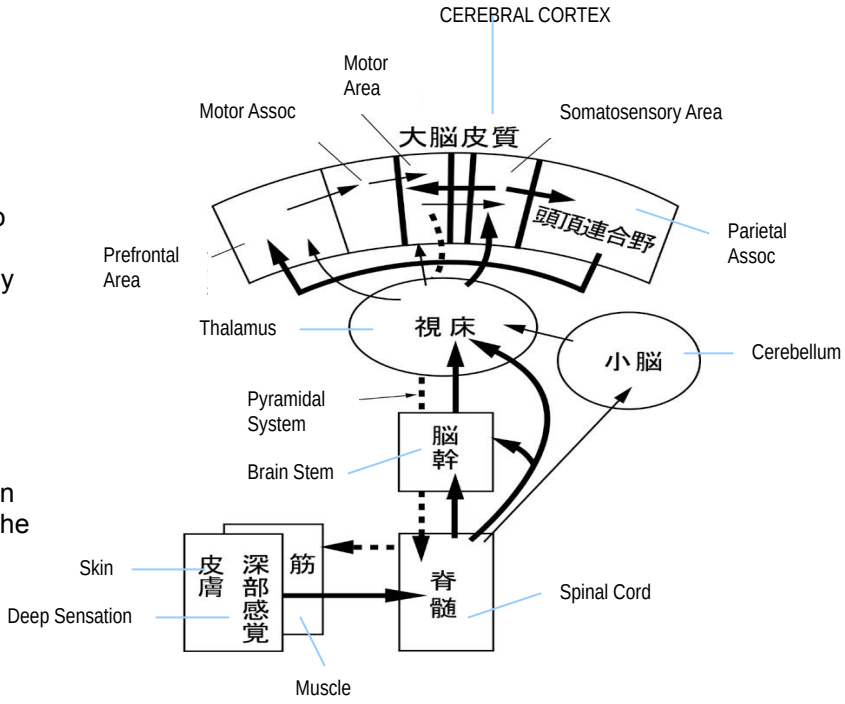


Figure 6. Sensory input system and motor output system. The thick black arrow shows the cutaneous projection system.

Authors have so far reported that, in the later phase component of the exercise-related brain potential in stretching the ankle joint voluntarily, since the potential in the parietal association area recognizing the motion of the foot was markedly increased immediately after discharge of active muscle with the use of Kinesio Tape, the information from the periphery might produce activation of the brain.

In the present results, it was strongly suggested that the excitability of the cerebral cortex persisted after repeated stretching of the wrist with the use of Kinesio Tape. It is believed that this may have a strong influence on the sensory input system and the motor output system and that Kinesio Tape may play a supplementary role in walking and maintenance of the posture in the elderly.