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Research Article

Use of Ninja Hand Signs to Eliminate Anxiety and Strengthen the Ability to Cope with Stress

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Abstract

Aim and Scope: I examined the significance of ninja hand signs in helping the mind and body to adapt to stress.

Methods: Ninja played an active role in society between 400 and 500 years ago, and the number of people who have inherited their skills is small. I worked with the remaining 5 ninjas, using electroencephalograms and electrocardiograms to examine the effects of hand signs on the mind and body. I examined the effects of a series of hand signs for 5 ninjas. Next, I applied the calculation task for 30 minutes to 10 controls who did not perform hand signs and 5 ninjas who performed hand signs and examined the course afterward.

Results: A series of hand signs was found to decrease beta and theta activity, increase alpha 2 activity, and made parasympathetic nervous activity dominant. When the control group was subjected to stress, their beta activity increased, theta and alpha 2 activity decreased, and sympathetic nervous activity became dominant. Conversely, when ninjas were exposed to stress after performing ninja hand signs, theta and alpha 2 activity increased, beta activity decreased, and no change was observed in their autonomic nervous functions.

Conclusion: I concluded that performance of hand signs enhances the ninja's ability to cope with stress by suppressing anxiety.

Keywords: Hand signs, stress, anxiety, EEG, sympathetic nervous activity, parasympathetic nervous activity

Introduction

People cannot escape from anxiety fundamentally because of the uncertainty of existence. Excessive anxiety hinders life in society and a method to mitigate anxiety is required. In modern times, people are trying a variety of ways to relieve anxiety, including meditation [1]. In Japan, ninjas were active from 400 to 500 years ago. Their main task was to collect information and to take it back with them. They were always immersed in stress and anxiety. One of the techniques they used was the performance of hand signs before a fight. From this, I deduced that a series of hand signs played an important role in coping with stress.

Currently, there are only a handful of successors to ninja skills, and now is the last opportunity to investigate the effects of their hand signs. I examined the effects of the hand signs on the mind and body and the ability to cope with stress using an electroencephalogram (EEG) and measurement of the function of the autonomic nervous system to determine whether a series of hand signs can be applied to general situations.

Methods

Participants and ethical considerations

This study was conducted with the approval of the ethics committee of Mie University Graduate School of Medicine. I asked the one remaining ninja who was taught the ninja skills passed down through his family by a family predecessor to participate in the study. This ninja passed down his skills to four successors, who were also asked to participate in the study. These five participants were male in their 50s and 60s. I recruited 10 healthy men in their 50s and 60s as the control group. No one in the control group had learned any of the ninja skills. I obtained informed consent from all participants.

Laboratory environment

The experiment took place in a quiet room with a temperature of 22 degrees Celsius. The luminance was 300 lux. The subjects sat on a soft chair and placed their right arm on the table. Participants were tested individually.

EEG measurement

Using a handheld high-powered EEG (BrainPro Light FM828T, Futek Electronics Co., Ltd.), sensor bands with two electrodes were attached to the forehead. The exploration electrode was Ep2 and the reference electrode was Ep1. EEG traces were recorded for a three-minute period with the left ear grounded. The percentages of theta (4-6 Hz), alpha 1 (7-8 Hz), alpha 2 (9-11 Hz), alpha 3 (12-13 Hz) and beta (14-30 Hz) waves in the traces were calculated. Data values of 20 μV or more per second at 3.0 Hz were excluded as artifacts.

Electrocardiogram (ECG) measurement

Electrocardiogram (ECG) traces were measured using CheckMyheart (TRYTECH Co., Ltd.). Measurements were conducted for five-minute periods. ECG data were analyzed by power spectrum analysis of the frequency according to the principle of maximum entropy using associated software, and the low frequency (LF; 0.04 to 0.15 Hz) and high frequency (HF; 0.15 to 0.4 Hz) components of the heart rate variability (HRV) were calculated. The HF and LF/HF values were used as indices of parasympathetic nervous activity and sympathovagal balance, respectively.

Experiment 1

Five people who had mastered the ninja skills participated. After resting for 10 minutes following the EEG and ECG measurement, participants performed a series of hand signs followed by EEG and ECG measurement for 31 minutes. The participants closed their eyes throughout the experiment except when doing a series of hand signs. Ninja spent 5 minutes in the usual condition. Next, the ninja made a series of hand signs. While ninja casted a charm composed of nine letters, they made the corresponding hand sign with both hands. The time required for a series of hand signs was 25 to 30 seconds. EEG traces were recorded before performing a series of hand signs and at 0-3 minutes, 4-7 minutes, 8-11 minutes, 12-15 minutes, 16-19 minutes, 20-23 minutes, 24-27 minutes and 28-31 minutes after performing a series of hand signs. ECG traces were recorded before performing a series of hand signs and at 0-5 minutes, 6-11 minutes, 12-17 minutes, 18-23 minutes and 24-29 minutes after performing a series of hand signs.

Experiment 2

First, EEG and ECG were measured at rest. The participants closed their eyes except when performing hand signs through the experiment. All participants were subjected to 30 minutes of Krapelin test as stress. Five participants who acquired the skills of ninja loaded with stress after performing a series of hand signs. The control group did not do anything before stress loading. After stress loading, EEG and ECG were measured. The way of measurement was the same as in Experiment 1.

Statistical analysis

For each ninja hand signs experiment, ninja stress experiment and control stress experiment, the mean value of the percentage of each type of wave in the EEG traces and HF and LF/HF values at each time point were tested by the Steel-Dwass test. In this analysis, ANOVA was unnecessary because F-statistics were not used.

Results

In Experiment 1, changes in theta, alpha 2, and beta activity that were seen around 10 minutes after a series of hand signs were performed are shown in Figure 1. Theta wave activity decreased significantly at 0-3, 4-7 and 8-11 minutes compared with the values before performing a series of hand signs. Beta wave activity decreased significantly at 0-3, 4-7, 8-11 and 12-15 minutes compared with the values before performing a series of hand signs. Alpha 2 wave activity increased significantly at 0-3 and 4-7 minutes compared with the values before performing a series of hand signs.

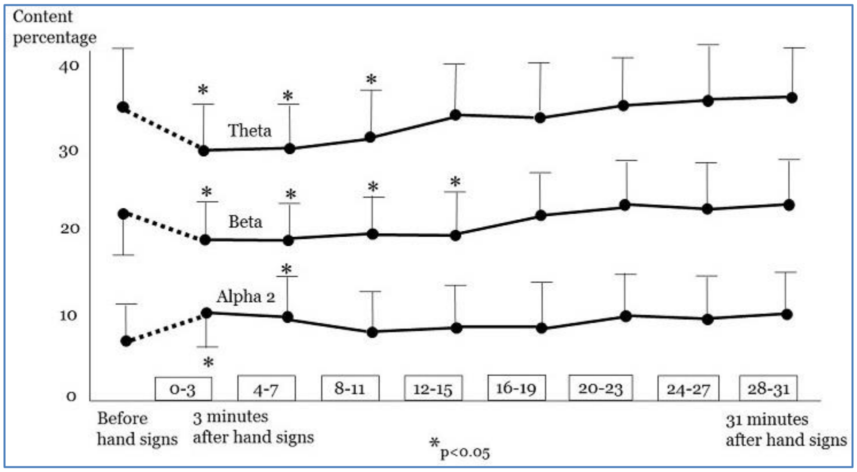

Figure 1: Changes of content percentages of EEG after hand signs in ninja

LF/HF values were significantly reduced at 0-5 and 6-11 minutes compared with the values before performing a series of hand signs (Figure 2). The HF component increased significantly at 0-5 and 6-11 minutes compared with the value before performing a series of hand signs (Figure 3).

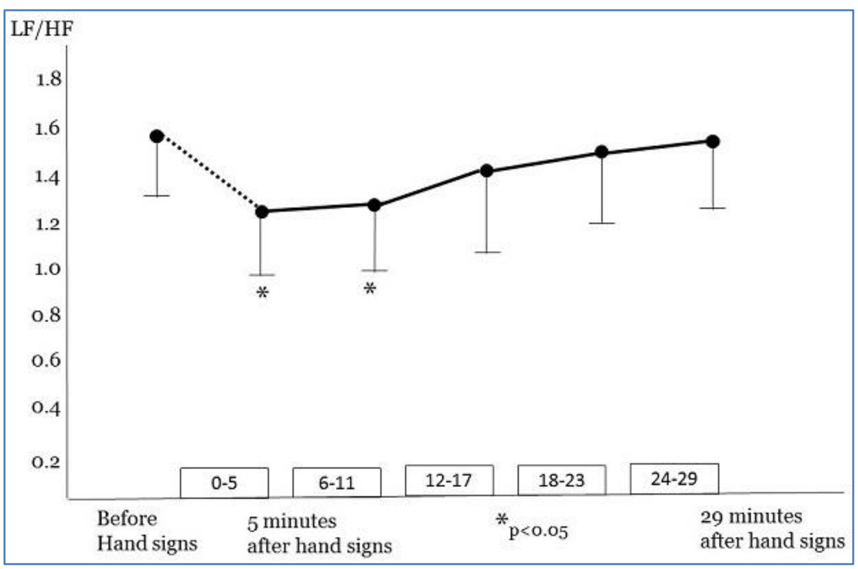

Figure 2: Changes of LF/HF value after hand signs

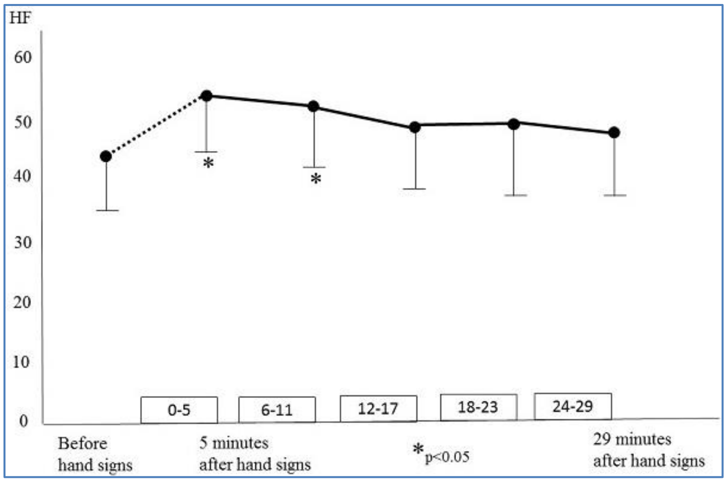

Figure 3: Changes of HF value after hand signs

In Experiment 2, stress caused a significant increase in beta wave activity at 0-3 and 4-7 minutes, and theta wave activity significantly decreased at 0-3 minutes compared with the value before subjecting participants to stress in the control group (Figure 4). In the control group, LF/HF values increased significantly with stress at 0-5 and 6-11 minutes (Figure 5), and the HF component decreased significantly at 0-5 and 6-11 minutes compared with the value before subjecting participants to stress (Figure 6).

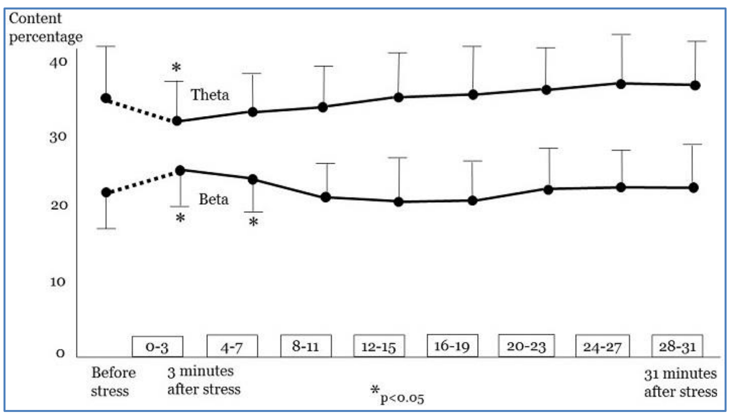

Figure 4: Changes of content percentages of EEG after stress in control group

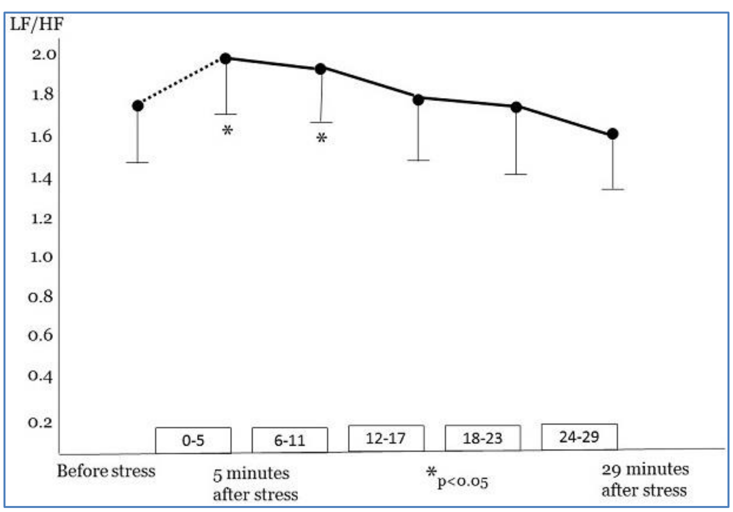

Figure 5: Changes of LF/HF value after stress in control group

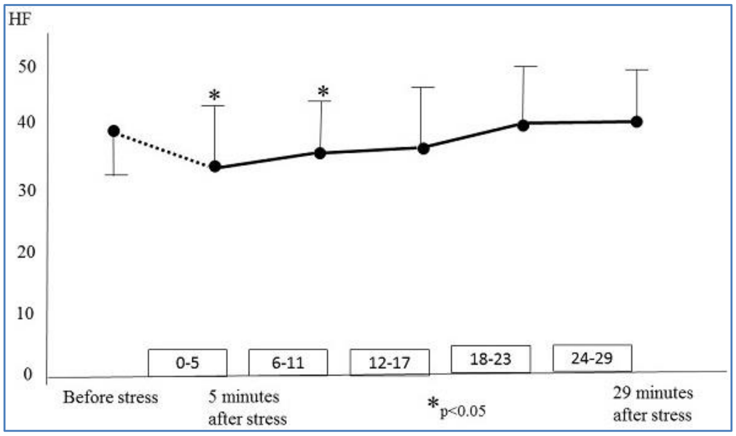

Figure 6: Changes of HF value after stress in control group

In the five participants who had acquired the ninja skills, there was no significant change in theta wave activity after stress. Alpha 2 wave activity increased significantly at 4-7 minutes and 12-15 minutes after stress compared with the value before subjecting participants to stress (Figure 7). Beta wave activity was significantly reduced at 4-7, 8-11 and 12-15 minutes after stress compared with the value before subjecting participants to stress (Figure 7). There were no significant changes in either the LF / HF or the HF value after stress.

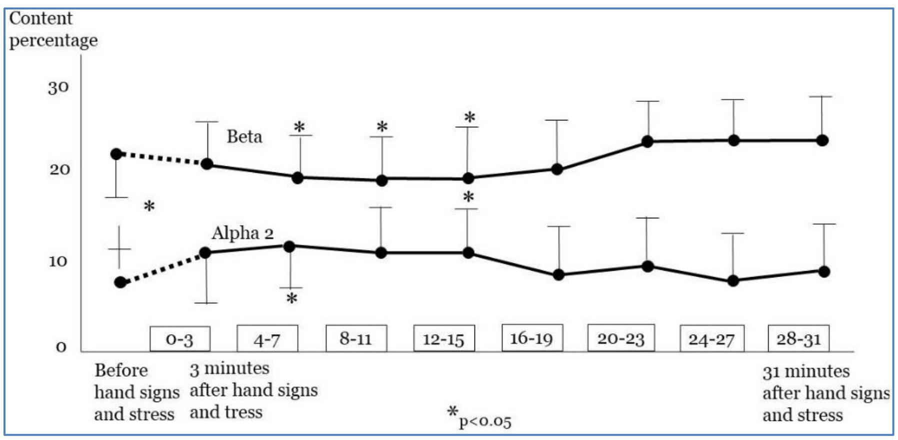

Figure 7: Changes of content percentages of EEG after hand signs and stress in ninja

Discussion

In this study, theta and beta activity in the brain decreased with the increase in alpha 2 activity, and parasympathetic nervous activity in the body dominated for about 15 minutes after performing a series of hand signs. Classically, theta activity is an indicator of drowsiness, beta activity of tension and anxiety, and alpha 2 activity of relaxed concentration. Recently, extensive studies on mindfulness have been conducted, for which an increase in frontal theta power is interpreted as an increase in focused attention [2-4]. It is difficult to interpret the significance of the change in theta activity in this study. Because a series of hand signs were done before battle, it seems reasonable to interpret the decrease in theta activity as a decrease in drowsiness. Alpha 2 activity classically indicates relaxed concentration. The lower alpha band reflects vigilance and attention, and the upper alpha band reflects task-specific processes such as those related to perception and cognition [5]. A decrease in beta power is interpreted as a decrease in anxiety [6]. The ninja testified that they gain energy from nature and the universe by performing a series of hand signs before a fight. They also testified that they carry out simple hand signs to return energy when they finish battle. Ninja originated in the Japanese mountain religion of Shugendo. The ninja philosophy has become less religious, but the importance of natural worship remains. There are several reports on the role of prayer in reducing anxiety [7-9], but there are no reports of anxiety in those who prayed for a short time. It seems that a series of hand signs probably act to reduce anxiety. It is believed that the ninja trained themselves to avoid anxiety through a short period of prayer. After performing a series of hand signs, the body's parasympathetic nervous activity became dominant. In a situation where a ninja was facing an enemy, hand signs are believed to have put the ninja in a state where they could respond flexibly immediately.

In the control group, stress caused a decrease in theta activity with an increase in beta activity, and sympathetic activity dominated. In the classical interpretation of brain waves, these findings mean a decrease in sleepiness and an increase in tension and anxiety, and in recent years, a decrease in theta activity is interpreted as a decrease in focused attention [5]. Even with recent findings, an increase in beta wave activity signifies an increase in anxiety and is usually interpreted as a stress response that signifies dominant sympathetic activity [6]. In the ninja, alpha 2 activity increased, and beta activity decreased when participants were subjected to stress. There was no change in autonomic nervous system functions. Ninja who performed hand signs showed a response to stress that was different from the control group and this appears to indicate a state that is resistant to stress.

The results of this study indicate that ninja hand signs are effective in relieving anxiety and putting the ninja in a state that is resistant to stress, and is thus aimed at survival, one of the ninja's primary goals.

LF/HF is considered to reflect sympathetic predominance [10]. Recently, it has been suggested that the LF/HF cannot accurately measure sympathovagal balance and that the correspondence with psychological and physiological conditions is not unique [11,12]. Although a method to resolve the ambiguity in the interpretation of LF/HF is being studied [13], this issue should be recognized in current research and future research improved in this regard.

It should be also kept in mind that the results of this research are limited, because of the ambiguity in interpreting the EEG trace, and the fact that measurements were only taken from the forehead. Further research in this field is needed.

Conclusion

The study found that that hand signs enhance the ability to cope with stress by suppressing anxiety. I intend to continue with this research using improved research methods.

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