

PHYSIOLOGY OF EXERCISE

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Experimental study of "Shin- Poh". *Judoka's way of feeling*

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Key words: riai (The rational relationship of interactive movements between oneself and the opponent. Riai aspect of a psychological and physical), shin-poh (riai: a psychological aspect), gi-hoh (riai: a physical aspect)

Abstract

At Mount Kinpo (2599 m, Nagano, Japan) we measured an autonomic nerve of a judo-ka. We used a small electrocardiograph with an active tracer (AC301A,GMS. Co. Ltd., Japan) for an experiment. We measured a sympathetic and a parasympathetic stimulation in the body while the judo-ka was climbing up to the top of the mountain. We found the characteristics of the judo-ka from the data including sympathetic and the parasympathetic nerve reaction after climbing the mountain.

Summary

Spectrum analysis was based on electrocardiogram and the high (HF) and low frequency (LF) power high frequency power (LF/HF) evaluated using an active tracer (AC301A,GMS. Co. Ltd., Japan) [Hosonuma, Asano 2010].

Sympathetic nerve activity index : LF/HF [Table 1]

Parasympathetic nerve activity index : HF [Table 1]

Table 1. Judo-ka's "Shin-Poh", the relationship of the sympathetic and the parasympathetic

Sympathetic nervous system (LF/HF↑)	Parasympathetic nervous system (HF↑)
Active condition	No activity
Tense	Sleep.
Stress	Relaxation
Judo playing	Meditation before and after Judo playing

Modified from J.C. Kincaid. (Medical Physiology 4thedition, Chap. 6, Fig. 6.1, 2012)

Introduction

During the Warring States period of Japan (15th ~ 16th century), there was a history of fighting between the districts for more than 180 years (*Onin War*, 1428-raising of the *Edo Shogunate*, 1605). The warriors actively practised "martial arts": mental (*shin-poh*) and physical training (*gi-hoh*) for the fight, fighting techniques, weapons and armour skills were greatly developed. In this study, we focused on the bare hand martial arts "judo (jujutsu)" and "*kappo*" (medical technique and self-defense) [Kuboyama 2012a].

Kappo is the art of survival. Both martial arts were correspondingly used by great warriors

during the Warring States period. *Kappo* was a way of dealing with one's own physical (*Gi-hoh*) and mental damage (*Shin-poh*) that occurred as a result of the opponent's "*Sappo*".

Today, *kappo* is a part of the medical system. However, in those times *kappo* was used by warriors, and therefore considered a martial art. In other words, *kappo* was one of the alternative techniques of "*sappo*" martial arts [Kuboyama 2012b]. In addition, in that era, the life of a warrior was not very valuable, so priority was given to "*sappo*". *Kappo* as a part of martial arts, became a system of medical techniques (like the modern *judo seifuku* today) treating fractures, dislocations, sprains, and

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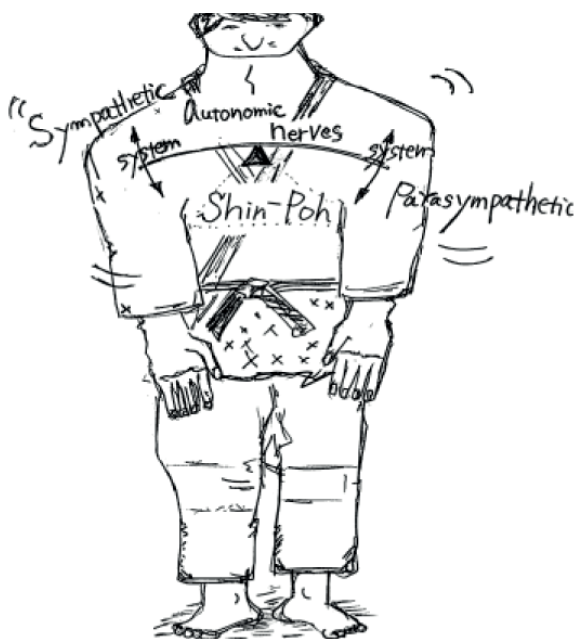
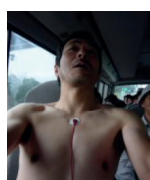


Figure 1. Modified from J. C. Kincaid. (Medical Physiology 4th edition. Chap.6, Fig.6.4, 2012)

bruises.

Kappo and *sappo* in judo, *shin-poh* of the martial arts are successful till now. We thought LF/HF or HF will be able to confirm the state of mind of the judoka (*shin-poh*). As a result, judoka's way of feeling (*shin-poh*) became clear by an experiment [cf. Murayama 1990; Todo, Seki 1992; Magara 1993; Sasaki 2004; Murata, Toudou 2005; Sasaki, Brad, Murata 2005; Kuboyama 2006; Tezuka 2011; Iteya *et al.* 2011; Figure 1].

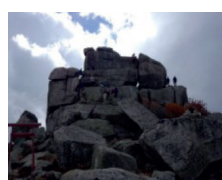
Table 2. The photograph which is climbing a mountain (1,2,3,4).



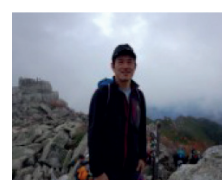
(1) We attached AC301A and tested autonomic nerve.



(2) The experiment involving climbing Mt. Kinpo (Nagano)



(3) We arrived to the top. (2599m)



(4) We measured LF/HF and HF

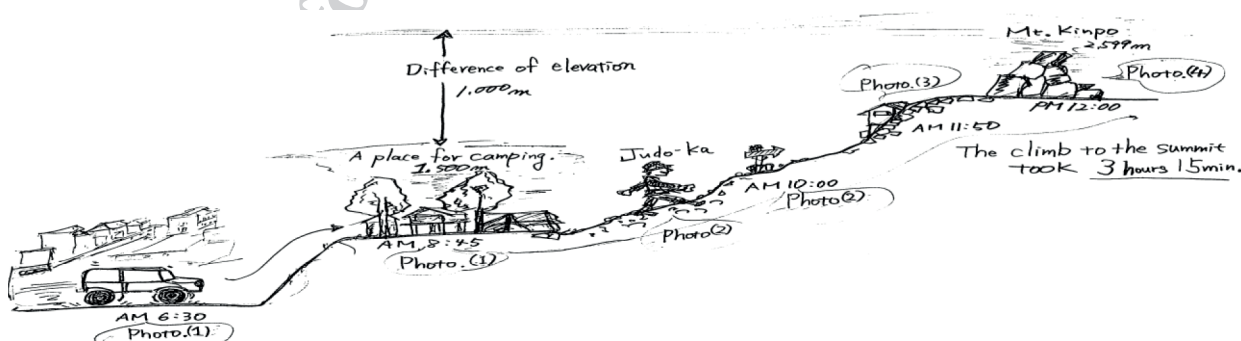


Figure 2. Exercise (climbing) Protocols. Modified from Kuboyama. (Japan Society Mountain Medicine. Report of

Table 2. Responses of Effectors to Parasympathetic and Sympathetic Stimulation

Effector	Sympathetic	Parasympathetic
Skin Sweat glands	Secretion [LF/HF↑]	None [HF↑]
Piloerector muscle	Contraction[LF/HF↑]	None [HF↑]
Skeletal muscle	Dilatin[LF/HF↑]	None[HF↑]
Heart Rate/Force	Increase [LF/HF↑]	Decrease [HF↑]

Modified from J.C. Kincaid. (Medical Physiology 4thedition. Chap.6 Fig.6.1 ,2012.)



Dilation of the pupil: Sympathetic (LF/HF ↑)



Constriction of the pupil: Parasympathetic (HF↑)

Figure 3. Responses of Effects to Sympathetic (LF/HF) and Parasympathetic (HF) Stimulation.

As a result of experiment

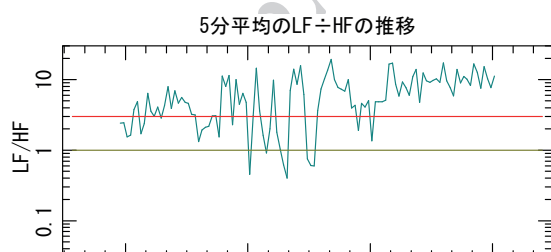
Experimental results supported the hypothesis. We observed LF/HF peculiar to a judoka’s and a wave pattern of the HF [Karabulut *et al.* 2006].

Table 2. showed the reaction of LF/HF and HF. For example, the wave pattern of [LF/HF↑] showed [Heart Rate/Force↑]. Contrarily, the wave pattern of [HF↓] showed [Heart Rate/Force↓].

During mountain climbing there were waveforms at [LF/HF↑],[HF↓]. It shows a predominance in the state of the sympathetic stimulation. And it is in a state (Figure 3, Dilation of the pupil). On the other hand, during “a break” of the mountain climbing, it was expected that it presents [LF/HF↓], a waveform of [HF↑]. And it is (Figure 3, Constriction of the pupil), [Johnson 1987; Masami, Eckhard 2012; Mikae, Kazunori 2012; Sudo, Saito, Nagai 2012].

Experimental result of judoka’s feeling (Wave pattern of LF/HF and HF)

Waving of LF/HF, [Figure 4-1 (Sympathetic stimulation)] and waving of HF, [Figure 4-2 (Parasympathetic stimulation)] were used to analyze

**Figure 4-1.** Waving of LF/HF during the activity of climbing a mountain. (LF/HF: Average of 5 minutes)

Shin-poh. The waves of LF/HF(↑↓) the change of the strain, and the wave of HF(↑↓) were the change of the slacking mind. (He was in a state of relaxation.)

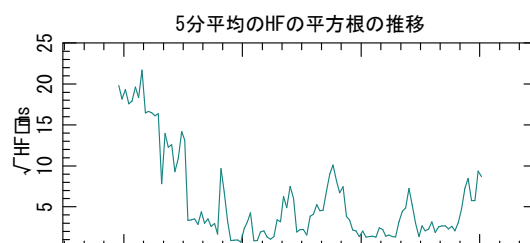
The wave pattern of the sympathetic nerve underwent a change of a high reaction during mountain climbing. On the other hand, the parasympathetic nerve showed a low reaction at a mountain climbing. However, there were several times of strong reactions of FH. These reactions were a relaxation during activity. We thought the reaction peculiar to a judoka. Thus, we analyzed “judo-ka’s feeling” by using *Anza*, *Shizen Hontai* and *Randori* (Figure 5).

Judo-ka was sitting with crossed legs, and he was in meditation during the *Agura*, before and after climbing. *Shizen Hontai* is an attitude of respect and thoughtfulness to one’s training partners, opponents, and all other people. *Randori* is an exercising of the Judo with a partner.

In spite of the whole intense mountain climbing, we could confirm a wave pattern similar to *Agura* and *Shizen Hontai* (Figure 5, Zone 1, Zone 2). In addition, the wave pattern of FH↑ (Green Line shows a wave pattern of FH climbing a mountain) was generated “assuming to be that *Shizen Hontai* and *Agura*” during climbing. “Meditation of the Judo (Judo-ka’s feeling)” seemed to be carried out during mountain climbing. We thought that these reactions were judo-ka’s unique way of feeling.

Conclusion

Shin-poh is “a way of feeling” of martial artists. We were able to draw it. And we were able to clarify “*Shin-poh*” climbing a mountain by this experiment. In addition, we were able to depict that a judo-ka’s

**Figure 4-2.** Waving of HF during the activity of climbing a mountain. (HF: Average of 5 minutes)

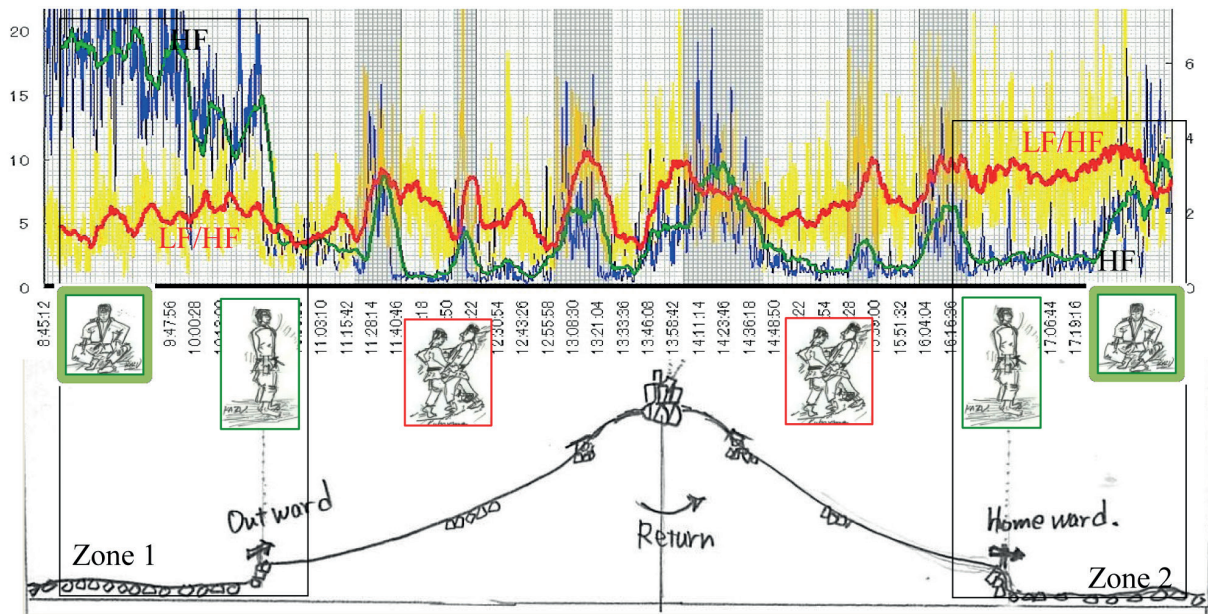


Figure 5. Analyzing mountain climbing in JUDO (KAZU wrote, 2012) Red Line shows a wave pattern of LF/HF climbing a mountain. And Green Line shows a wave pattern of FH climbing a mountain. In other words Red and Green show a stimulation state of sympathetic nerve and the parasympathetic of each nerve. In the figure, Red frame and Green frame (Illustrations) show *Agura* (Green), *Shizen Hontai* (Green), *Randori* (Red) in JUDO.

Agura : Sitting with crossed legs. And meditation performed in the *Agura* and *Seiza* before and after training.

Shizen Hontai : An attitude of respect and thoughtfulness to one's training partners, opponents, and all other people, for all Nature. *Randori* : An exercising of the Judo with a partner.

experience (and feeling) of Judo and climbing a mountain (Figure 5).

As the result, we obtained the result that parasympathetic stimulation (HF \uparrow) having expressed the psychological condition of *Agura* of the Judo-ka at the beginning of mountain climbing. During mountain climbing ("when he felt that took a break"), HF \uparrow represented a wave pattern of *Agura* and *Shizen Hontai* (Figure 5, Gap, Zone 1-2). These data suggested that the wave patterns during Judo playing could be similar to that of climbing.

Further research will be required to write the ethnography and to research *Shin-poh*. We will continue an investigation for *Shin-poh* whole aspect elucidation.

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Badania doświadczalne “Shin-Poh”. Sposób odczuwania judoki

Słowa kluczowe: riai (racjonalny związek interaktywnych ruchów między sobą a przeciwnikiem), riai (aspekt psychiczny i fizyczny), shin-poh (aspekt psychologiczny), gi-hoh (aspekt fizyczny)

Streszczenie

Celem autora było zbadanie samopoczucia judoki w trakcie wspinaczki wysokogórskiej i porównanie wyników do uzyskanych w czasie walki.

W czasie wspinaczki na Mount Kinpo (2599 m n.p.m., Nagano, Japonia) autor dokonał pomiaru autonomicznych nerwów judoki, używając małego elektrokardiografu z aktywnym tracerem (AC301A, GMS. Ltd., Japonia). Pomiar dotyczył współczulnej i przywspółczulnej stymulacji w organizmie podczas wspinania się na szczyt góry oraz stworzenia charakterystyki judoki. Podmiotem badania był 48-letni judoka (5 dan) z doświadczeniem w pracy z dziećmi, osobami starszymi i niepełnosprawnymi.

Autor mówi także o technikach walki: mentalnych (*shin-poh*) i fizycznych (*gi-hoh*), przedstawia wyjaśnienia dotyczące „kappo” (sposobu radzenia sobie z fizycznymi i psychicznymi defektami), metody uważanej za element systemu sztuk walki. W rezultacie eksperymentu stwierdzono, że wysiłek podejmowany w czasie walki judo jest podobny do rezultatu osiągniętego w czasie wspinaczki wysokogórskiej.