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ORIGINAL

Acupuncture's evidences: even slight stimuli could alter body functions, suggesting a "resetting" effect

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ABSTRACT

Once the acupuncture had mushroomed after the visit of former president Richard M. Nixon to China in 1972[1, 2], quite a few researchers denied the effects, concluding with theatrical placebo[3-7]. We showed, however, the acupuncture's evidences and propose a new interpretation of the mechanism, a "resetting" effect. Even slight stimuli, such as needle-patches, could affect our body function: heart rate variability (HRV) and pupillary light reflex. In addition, the treatments significantly reduced the variations observed before the treatment. As for the frequency domain analysis using FFT (fast Fourier transform), the total power of the frequency domain was reduced as compared with that of placebo case after the treatment. Base on the evidence presented here, the homeostasis could be awakened by the slight stimuli of the insertion of the needle and thereafter the subsequent relief of the stress could make the homeostasis more effective, resulting in returning to the initial condition, so-called healthy status. This phenomenon looks like that computer systems become normal by pressing the resetting switch. The "resetting" effect of acupuncture is thought to be useful idea in elucidating the mechanism hereafter.

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Key words: acupuncture, needle-patch, resetting effect, heart rate vrariability, pupillary light reflex

1 Introduction

In clinical researches on acupuncture, placebos or sham treatments are difficult to use as controls[8, 9]. Furthermore, the researchers usually used strong stimuli and multiple points, which were accompanied with pain and even in the control cases. Such kinds of studies make it a matter of complex systems, resulting in more difficult to analyze the effectiveness. The patients would endure the painful procedures in order to get rid of their malaise symptoms. Although we cannot treat the patients if they dislike the acupuncture, it prevails on the world, giving enough satisfactions to patients. There must be something, therefore we would like to pile up the evidences of the acupuncture for the better life.

The pain signal caused with the acupuncture would inhibit some neurons in the brain by enduring it intentionally. The removal of the needle leads to his/her relief from not only the stress of the acupuncture but also the malaise feeling in the end. There would be some mechanisms like brain reward system with inhibitory GABAergic neuron in the accumbents[10]. A pain is thought to affect our body function via sympathetic nervous reflex. Therefore we eliminated the pain as possible as we could, using very tiny needles of 0.0 mm, 0.3 mm and 0.6 mm in length and 0.2mm in diameter (Fig. 1. A, B, C). The subjects with the needle-patch had almost no or very little pain compared with conventional acupuncture needles (Fig. 1D, E: 50 mm in length). For detecting the alteration of the function of autonomic nervous system, we used heart rate variability (HRV: fig. 2A) with fast Fourier transform (FFT) and the power spectrum of the frequency domain[11]. In addition, we applied the pupillogram of the Irismeter (Fig. 2-B). Using these two kinds of indices, we studied on the acupuncture effects to the body function with the painless needle-patches.

2 Subjects and Methods

Twenty healthy volunteers（10 males and 10 females ages 20-59) for the experiment and the seven out of the volunteers and four newly attended healthy ones for control (no patch) were explained to get the informed consent according to the method

that has been approved by the Sapporo Medical University Ethics Committee. The average age was 30.2 years old (14 males and 10 females). Each subject of the experimental groups was treated three-times on different days with 0.0 mm (placebo), 0.3 mm and 0.6 mm in length needle-patches (Pyonex, SEIRIN Corporation) by choosing an envelope containing one of the patches to determine the needle's length. Since this study design is a crossover single-blind method, they did not know what kind of patch was applied. As controls, the 11 cases were not treated, just resting on a couch like other cases. After 5 min explanation about the protocol (Fig. 2 D), the subjects, sitting on a couch in a quiet room, were measured for the HRV during 5 min using CheckMyHeart 3.0 (DailyCare BioMedical Inc: Fig. 2 A), and then for the papillary light reflex parameters (IRIS) during 5 min using Irismeter (DM2010: Iritech Co. Ltd. Japan:Fig. 2 B-1). After the first measurement (M1), one of the three kinds of needle-patches was applied on the acupuncture point (PC6: Naikan) of each forearm for 15 min (Fig. 1F). After 15 min resting with the patch, the second HRV and IRIS measurement (M2) were performed for 5 min each. Then the patch was removed, after resting for another 15 min, third measurement (M3) was performed. The HRV measurement includes the RR intervals of the electrocardiogram and the power spectrum (VLF: very low frequency power [0-0.04 Hz], LF: low frequency power [0.04-0.15Hz], HF: high frequency power [0.15-0.4 Hz], and TP: the total power) calculated with the CheckMyHeart by fast Fourier transform. For the analysis of the effects of the needle-patch on the pupillary light reflex, the parameters of the pupilogram illustrated in the figure 2 (B-3) were used. A measurement of the pupillary light reflex is consisted of three consecutive recordings (D1/S1, D2/S2 and D3/S3 for right and left eyes respectively in the figure 2 B-2). The first (D1/S1) and second (D2/S2) recordings were stimulated with weak light (3±1lux) and the

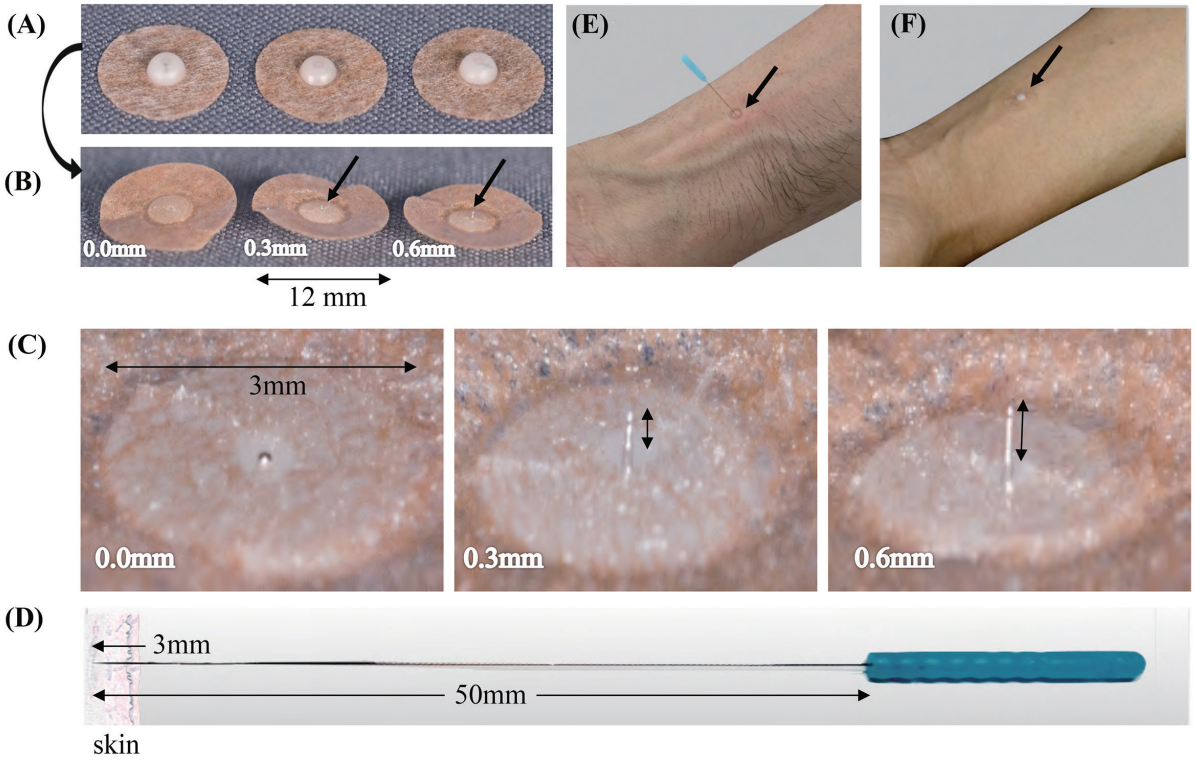


Fig 1. Three kinds of needle-patches and a popular needle and the treatments. (A) Outer surface of the patch with a plastic mount. It holds a needle on the other side that contacts the skin surface. (B) Turning over the patches, very tiny needles (arrows) can be seen. (C) The magnified images of needles (0.0 mm, 0.3 mm and 0.6 mm in length and 0.2 mm in diameter). The 0.0 mm length needle-patch was used as a placebo. (D) A popular disposable needle with 50 mm in length and 0.2 mm in diameter. Only the tip (about 3 mm in length) is inserted into the subcutis of the skin (see also fig. 2 C). (E) Popular type of Japanese acupuncture inserted to the skin (arrow: acupuncture point of Naikan[PC6] in the forearm). (F) A patch-type needle is affixed to the skin.

last (D3/S3) was with strong one (150±20 lux). We studied on the changes of the parameters and the patterns of the pupillogram before (M1), during (M2) and after (M3) the treatment with the needle-patches. And then we asked the subjects whether they felt pain or not when applying the patch. The parameters were statistically analyzed with paired t-test using StatFlex (Ver.6: Artech Co. Ltd). In the case of the power spectrum of HRV, since there were extremely noisy cases, two outliers were excluded for the analysis.

Hereafter we use abbreviated expressions (control, placebo, 0.3mm and 0.6 mm) for no treatment, 0.0 mm, 0.3 mm and 0.6 mm in length needle-patch respectively and M1, M2 and M3 for first measurement before the treatment, second measurement during the treatment and third measurement after the treatment, respectively.

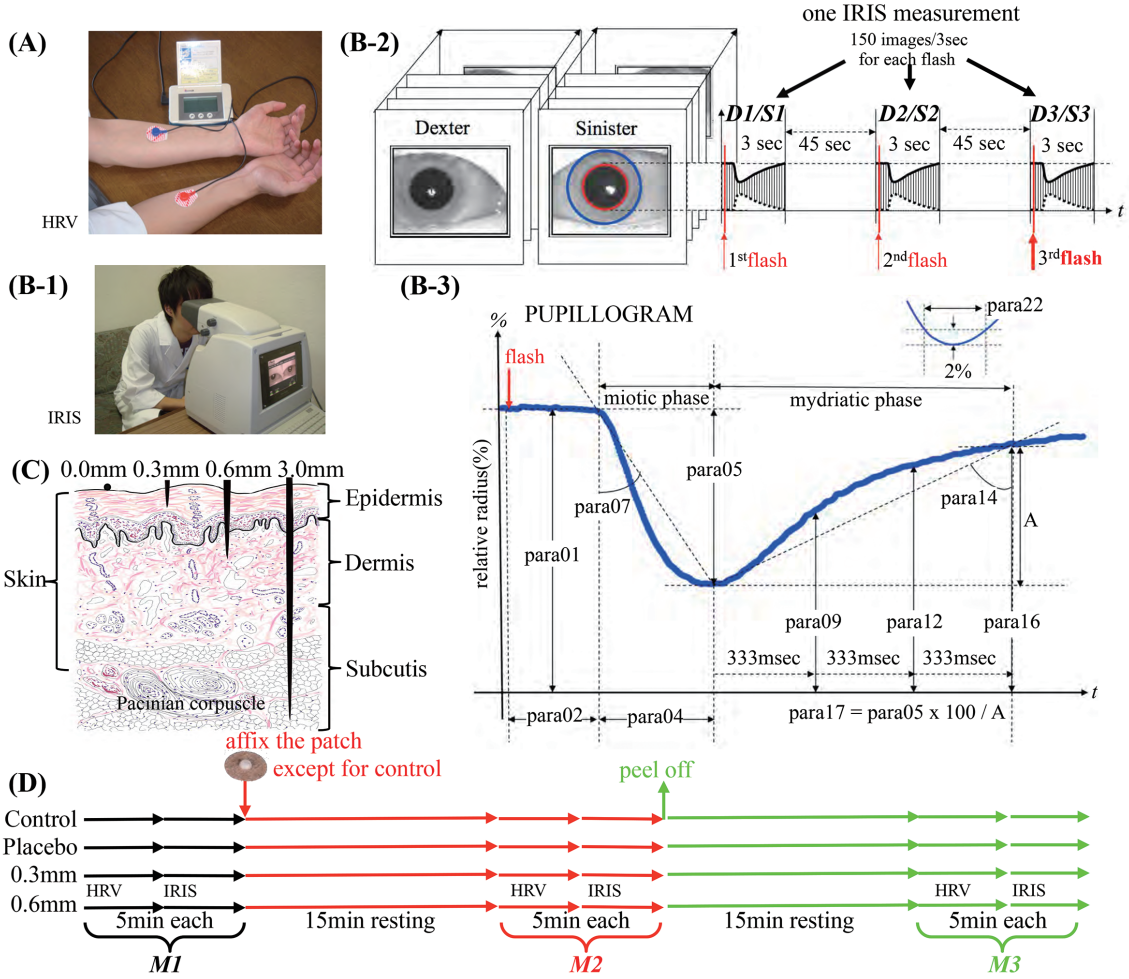


Fig 2. Heart rate variability (HRV) and pupillary light reflex (IRIS) measurements. (A)HRV measurement with CheckMyHeart 3.0 (DailyCare BioMedical Inc) provides RR intervals and power spectrum of FFT analyzed (Table 1). (B-1) Irismeter (DM2010:Iritech Co. Ltd. Japan). (B-2) Schematic explanation of IRIS measurement. Natural light was used for three times flash stimulations and infrared for the detection of the iris images. After each flash, one hundred and fifty images in 3 sec are recorded for both eyes (the right and left iris data is denoted as D1 or S1, D2 or S2, and so on) with 45 sec intervals. The pupillogram is consist of 150 dots, each of which is the value of the inner circle (red) of the pupil divided with the outer perimeter (blue) of the iris (%). (B-3) Pupillogram and parameters. Pupillogram provides twenty five parameters. The eleven parameters indicated here were used for statistical analysis (table 2, 3). For example, the parameter 1 (para01) is the initial pupil relative radius (%), para05 is a max constriction percent of the iris after each flash, and so on. (C) Schematic image of the needles in the skin. 0.6 mm needles are trans-epidermal invasion of the tissue, expected to penetrate into the epidermis reaching the dermis, while 0.3 mm needles are intra-epidermal invasion without penetrating into the dermis. Japanese popular acupuncture is about 3mm penetration in depth reaching the subcutis, though it depends on the case. In the subcutis, there are various kinds of mechanoreceptor structures, such as Pacinian corpuscles and so on. (D) The protocol. M1: measurment before the treatment, M2: measurement while affixing the patch, and M3: measurment after removing the patch and resting for 15min to see the lasting effect.

3 Results

3・1 HRV（Table 1）

In the control (no treatment) the RR interval increased with time and presented significant differences in all inter-Ms; M1:M2 p=0.09%, M1:M3 p=0.10%, M2:M3 p=3.02%. On the other hand, the frequency domain parameters (HF, TP, LF, VLF) showed no significant differences in all inter-Ms. The experimental groups with needle-patches (placebo, 0.3 and 0.6 mm) present a similar trend to that of control's RR interval but the removal of the patch stopped the increment of the RR interval between M2 and M3 (M2:M3). The frequency domains were not significantly affected in the control, while the treated groups demonstrated characteristic tendencies. The insertion of the 0.3mm and 0.6mm needle-patch (M1:M2) significantly increased HF (p=4.68%) + TP(p=1.15%) and TP (p=3.19%) respectively and the removal of the patch decreased TP (p=4.6%) and LF(p=2.98%) + HF (p=4.49%) + TP (p=3.19%) respectively (Table 1).

The TP value of 0.6 mm in M3 was significantly reduced as compared with that of placebo (p=0.7%), not shown in the table 1.

3・2 IRIS（Table 2 and 3）: pupil light reflex

For this analysis, we focus on the right eye data: D1, D2 and D3 of each parameter in table 2 and 3. The table 2 showed the significant differences between each condition (placebo, 0.3 mm and 0.6 mm). A variety of significant differences were unexpectedly observed in M1 between each condition (placebo, 0.3mm and 0.6mm). Any treatments were not given yet in M1. These evidences indicate the pupil is highly sensitive depending on a variety of physical as well as psychological status of the body. On the contrary to the M1, in the M2 and M3 the number of the significant differences was decreased but some of the significant changes were also detected. In the M2, the D1 parameters (para07, para14 and para22) between the placebo and the 0.6 mm, the para17 of the D1 between 0.3 and 0.6 mm and the para07 of the D2 showed significant differences. In the M3, the significant differences of the D1's parameters between each condition were not detected. Only three parameters (D2-para16, D3-para01 and D3-para12) were significantly different

Table 1. Statistical results of heart rate variability. M1:M2 of Inter-Ms means the comparison between M1 with M2, and so on. ↑: up trend, ↓: down trend. RR: RR Interval of electrocardiogram, the others are power spectrum of FFT (fast Fourier transform). VLF: Very Low Frequency (0 – 0.04 Hz), LF: Low Frequency (0.04 – 0.15 Hz), HF: High Frequency (0.15-0.4Hz), TP: Total Power. In general, HF is an indicator of parasympathetic nerve activity, LF/HF ratio is an indicator of sympathetic nerve activity and TP is an indicator of whole autonomic nerve. LF/HF ratio not shown due to no significant differences.

Statistical Results of Heart Rate Variability
11 subjects（control）, 20 subjects (placebo, 0.3, 0.6)

	Inter-Ms	RR	VLF	LF	HF	TP
Control	M1:M2	0.09↑				
	M1:M3	0.10↑				
	M2:M3	3.02↑				
Placebo	M1:M2	0.01↑	0.13↑			
	M1:M3	1.92↑	*2.03↑			
	M2:M3			2.90↓		
0.3mm	M1:M2	0.00↑			*4.68↑	*1.15↑
	M1:M3	0.00↑				
	M2:M3		2.67↓			4.60↓
0.6mm	M1:M2	0.52↑				*3.19↑
	M1:M3					
	M2:M3			2.98↓	4.49↓	3.19↓

Paired t-test , *Non-Parametric (Wilcoxon), P-value is represented as a percentage

Table 1.

between the placebo and the 0.6 mm.

The table 3 showed the significant differences between the measurements (inter Ms; M1:M2, M1:M3, and M2:M3). These results also teach us that D1 data are very sensitive but the tendency of the parameter 01 is similar to that of RR of HRV. Unlike those of D1, the inter Ms of D2 in the control and placebo did not display any significant differences, as for those of Ms of D3 showed only one significant difference (M1:M2 para14 p=0.97, M2:M3 para22 p=2.72) in the control and the placebo, respectively. There were several significant differences in D2 and D3 for 0.3 mm and 0.6 mm (Table 3).

3・3 Pupilogram

The time-course change of the relative radius of the pupils in the M1, M2, and M3 was presented as a graph (pupilogram) in the figure 3, 4, and 5. The initial segment (parameter 01) of the relative radius decreased with time (M1 → M2 → M3) in all conditions (Table 3 para01, Fig. 3 A, B, C). The minimum of the relative radius against the light reflex corresponds to the parameter 05 (Fig. 2 B-3). The difference of the parameter 05 between M1 and M2 (Fig. 3-F, Fig. 4. 0.3mm D1) was most significant with the 0.3mm (p=0.17%: Table 3). In the control, the D1-, 02- and 03-parameter 05 of M2 become larger than those of M1 (Fig. 4. Black upward arrows M1-> M2 mean the increment of the parameter 05), but in 0.3 and 0.6 mm, those of M2 become smaller than those of M1 (Fig. 4. Blue downward arrows mean increment of the parameter 05) except for those of the D2. In other words, the tendency of the parameter 05 from M1 to M2 in control case is inverted from upward [black arrows] to downward [blue arrows] in the 0.3mm and 0.6 mm cases.

Table 2. Statistical results of the parameters of M1, M2 and M3 pupillograms for each condition. The 11 parameters of D1, D2, D3, are compared among the conditions (placebo, 0.3mm and 0.6mm). Not only the control group but also the other group of M1 measurement (before treatment) shows a lot of significant differences, which suggest that all subjects were healthy, looked like similar physical status and try to keep their condition constant, but the reactions of the pupillary light reflex vary very greatly. Even 20 min after getting rid of the stimuli, the reaction pattern of pupillary light reflex becomes almost same pattern. All significant differences in M3 are between placebo and 0.6mm.

Statistical Results of Pupillogram Parameters
with placebo, 0.3 mm and 0.6 mm in length needle-patch

M1:Before

1: Measurement of before treatment

	PARA	01		02		04		05		07		09		12		14		16		17		22	
	LEN	0.3	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3	0.6
D1	Plac																				3.76↓		
	0.3								4.65↑		1.48↓		3.70↓		2.22↓								
D2	Plac				3.98↓																		
	0.3										3.94↓												
D3	Plac						3.17↑																
	0.3																						

M2:During

M2: Measurement of during treatment

	PARA	01		02		04		05		07		09		12		14		16		17		22	
	LEN	0.3	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3	0.6	0.3	0.6
D1	Plac										1.30↓						2.18↓						1.23↓
	0.3																				0.57↑		
D2	Plac										3.77↓												
	0.3																						
D3	Plac																						
	0.3																						

M3:After

M3: Measurement of after treatment

	PARA	01		02		04		05		07		09		12		14		16		17		22	
D1	Plac																						
	0.3																						
D2	Plac																	4.89↑					
	0.3																						
D3	Plac		1.72↑											4.83↑									
	0.3																						

Table 2.

PARA:parameter LEN:mm in length Plac:Placebo 0.3: 0.3 mm in length 0.6:0.6 mm in length

P-value is represented as a percentage

Table 3. Statistical results of the parameters among inter-Ms. D1 data showed a lot of significant differences and D2 and followed by D3. This also means strong or repetitive stimuli of light aroused the regular pattern of the body reaction.

Statistical Results of the Pupillogram Parameters Among Inter-Ms

D1

	Inter-Ms	para01	para02	para04	para05	para07	para09	para12	para14	para16	para17	para22
Control	M1:M2									2.78↓		
	M1:M3	0.26↓					0.00↓	0.05↓		0.02↓		
	M2:M3					0.26↓	0.39↓	0.36↓		1.06↓		
Placebo	M1:M2	1.16↓					0.01↓	0.05↓		0.00↓	0.02↓	
	M1:M3	0.15↓					0.44↓	0.23↓		0.00↓	*0.01↓	
	M2:M3											
0.3mm	M1:M2	1.98↓			0.17↑	0.02↓	0.01↓		3.87↓	0.00↓	*0.15↓	1.68↓
	M1:M3	0.19↓			4.01↑	0.32↓	0.34↓			0.16↓	3.25↓	
	M2:M3											
0.6mm	M1:M2					0.16↓			0.26↓			
	M1:M3	1.76↓					4.67↓	3.55↓		0.53↓		
	M2:M3									4.56↓		

D2

	Inter-Ms	para01	para02	para04	para05	para07	para09	para12	para14	para16	para17	para22
Control	M1:M2											
	M1:M3											
	M2:M3											
Placebo	M1:M2											
	M1:M3											
	M2:M3											
0.3mm	M1:M2											
	M1:M3	1.62↓						2.98↓		3.56↓		
	M2:M3											
0.6mm	M1:M2			2.93↓								
	M1:M3								3.17↑			
	M2:M3					0.63↑						0.94↑

D3

	Inter-Ms	para01	para02	para04	para05	para07	para09	para12	para14	para16	para17	para22
Control	M1:M2								0.97↑			
	M1:M3											
	M2:M3											
Placebo	M1:M2											
	M1:M3											
	M2:M3											2.72↑
0.3mm	M1:M2			1.37↑								2.12↑
	M1:M3											0.18↑
	M2:M3											
0.6mm	M1:M2											
	M1:M3										0.41↓	
	M2:M3											

Table 3.

Paired t-test , *Non-Parametric (Wilcoxon), P-value is represented as a percentage

3・4 Relations with pain feelings

In the 0.3 mm group, 19 subjects felt no pain except the case-1 (Fig 5 A). On the other hand, in the 0.6 mm group, 19 subjects felt pain but the case-2 did not declare any pain-feeling (Fig 5 B). All the subjects did not know the length of the needle, however, the pupil of the case-1 was already dilated before the treatment showing the parallel deviation of the whole graph to the upward (Fig 5 A-M1). With 0.6mm needle-patch, the M2 and M3 pupilogram of the case-1 are lowered compared with that of M1 to almost the same levels of the case-2 in M3 (green lines in Fig. 5 A,B). The case-2 represents almost constant stable shape of the pupilogram among M1, M2 and M3.

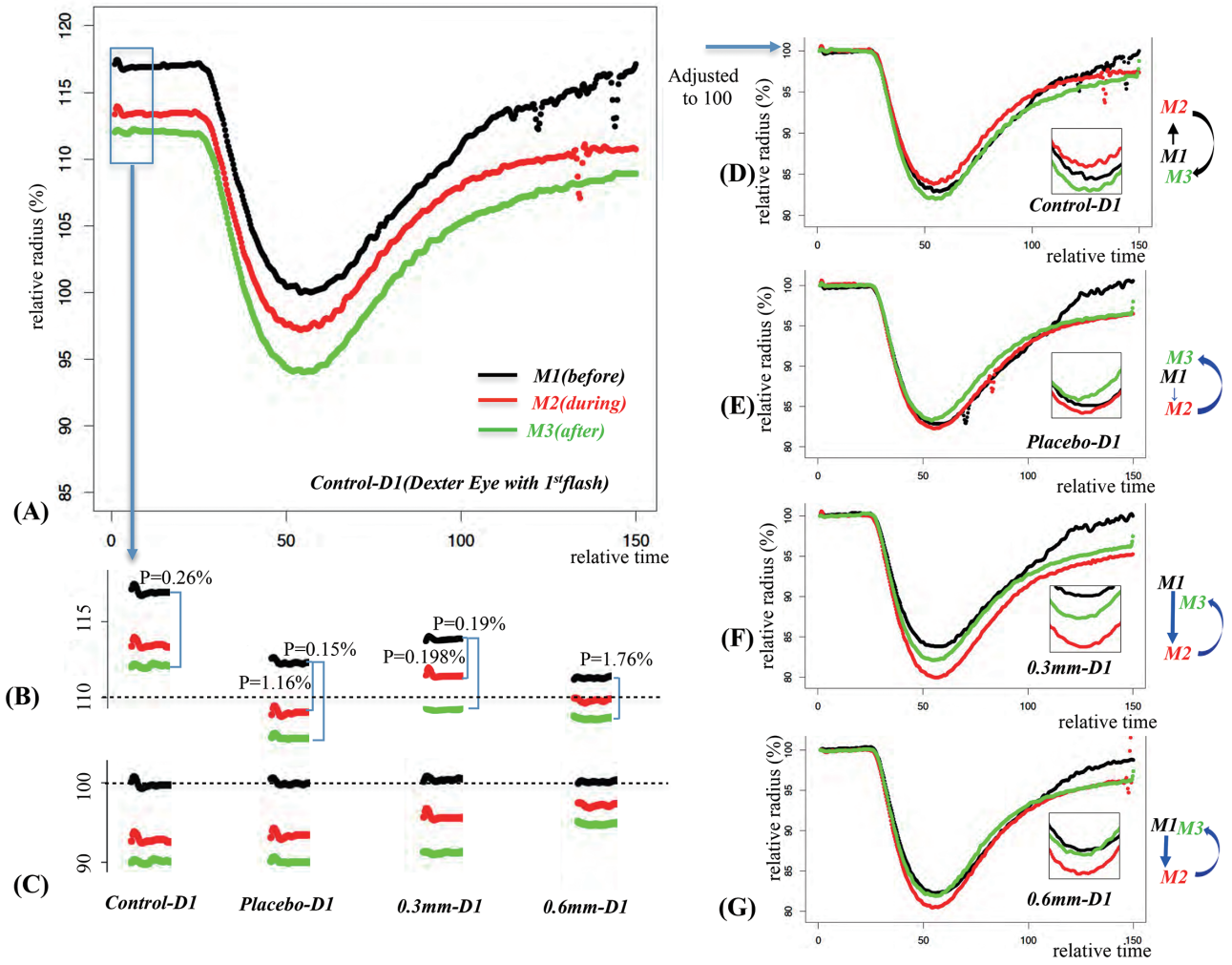


Fig 3. Original and adjusted pupillograms. Pupillograms are drawn with 150 consecutive points, which are the average value of each treated case unless otherwise mentioned. The M1, M2 and M3 pupillograms are simultaneously presented in a graph. (A) The pupillogram of D1 data of control-case. (B) The initial pupil radius (corresponding to parameter 01) of M1, M2 and M3 in Control-D1, Placebo-D1, 0.3mm-D1, and 0.6mm-D1 cases are compared indicating the significant differences among inter-Ms (M1, M2, M3) with right square parenthesis and p-values. (As for the parameters, see Table 3 in detail). (C) For comparison, the initial values drawn above were adjusted to move the graph to the value of 100. Note that in the control case, the trend between M1 and M2, and the significant difference between M1 and M3 are thought to be due to resting effect. (D-G) Each graph is adjusted to 100 so as to compare the changes among inter-Ms. The most concave pupillogram portion, which is corresponding to the max constriction of iris with the light stimulation, is magnified in the squares at the right bottom of the each graph and the trend is indicated with arrows among M1, M2, and M3 characters adjacent to the graphs.

4 Discussion

It is obvious that the sensing of the patch attachment is conveyed via nervous system reaching to the sensory cortex with or without pain feeling. They all perceived the sensation, of course. Therefore, the sensing properties would become also meaningful to our body. Libet[12] said that there is subliminal perception and that a simple repetition of sub-threshold stimuli elicits conscious sensation. Though the mechanism is unknown, the signals with the needle-patch to the skin increased the power spectrum and the removal of the signals also resulted in stopping of the tendency seen in the control, These tendencies were observed not only for the RR interval in placebo, 0.3mm and 0.6mm case, but also the power spectrum of the frequency domain, irrespective of painful or not. Furthermore, the tissue invasive signals of 0.3 mm and 0.6mm needle could continue to affect our body function to some extent. Because the effects were lasting for 15-20 min after the removal. Besides, the difference

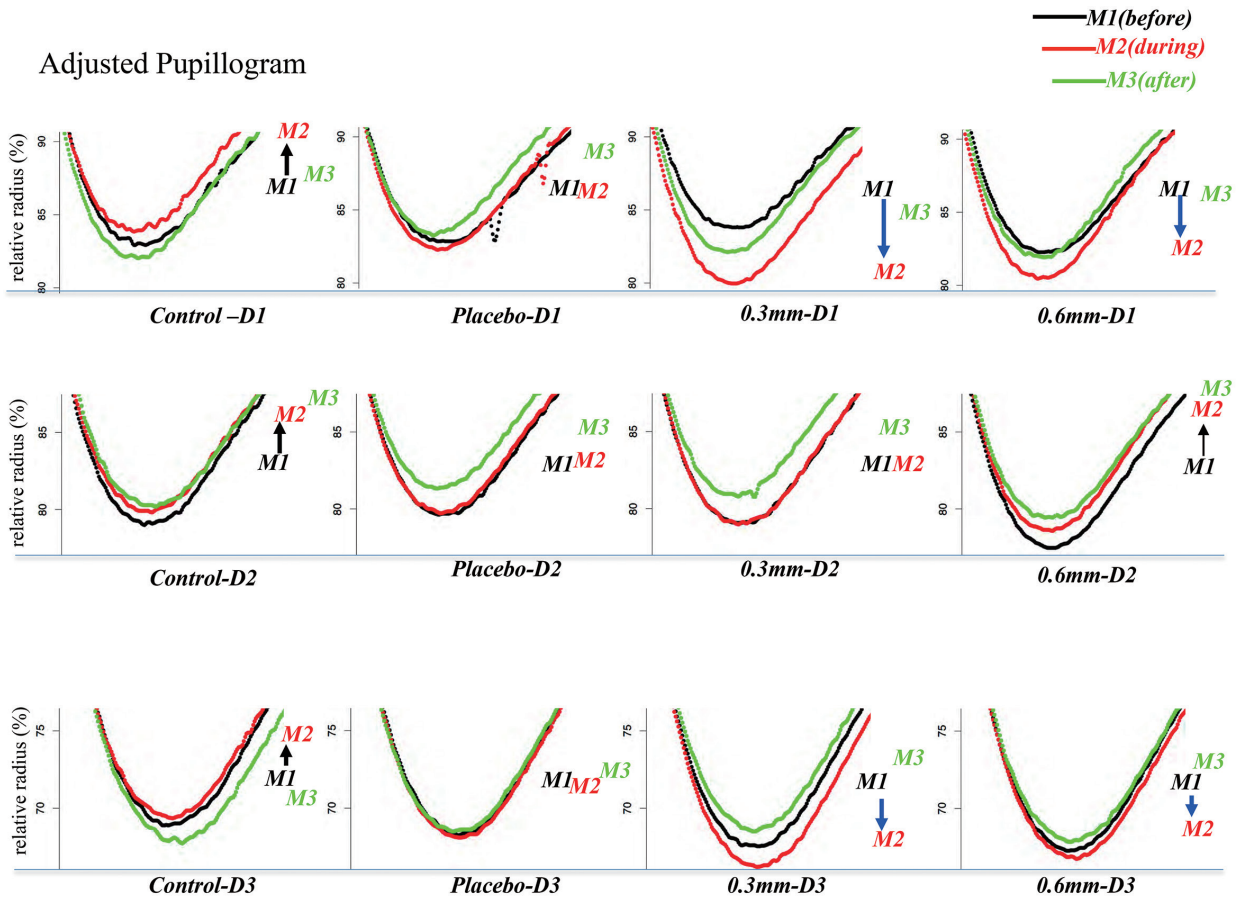
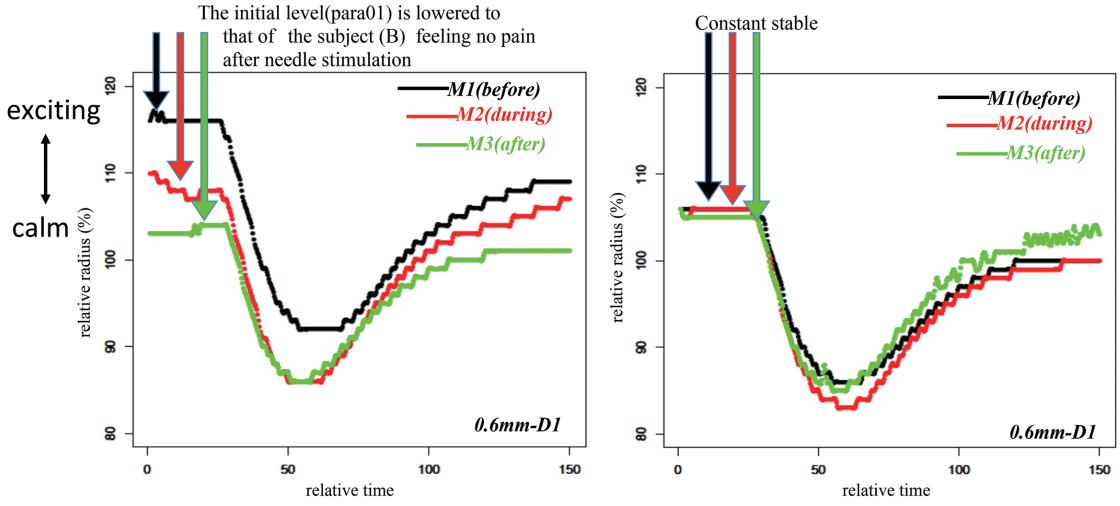


Fig 4. Adjusted pupilograms around max constriction of the iris. All pupilograms are adjusted the initial value (Parameter 1) to 100 like figure 3(C-G). The tendency of the resting and treatment effect is also indicated by Ms characters with arrows (black and blue).



(A) Case-1 in 0.6 mm-D1 **(B)** Case-2 in 0.6 mm-D1

Only one subject (case-1) feeling pain in 20 subjects for 0.3mm acupuncture

Only one subject (case-2) feeling no pain in 20 subjects for 0.6mm acupuncture

Fig 5. Original (not adjusted) pupilograms of the individuals in 0.6mm. (A):case-1. In the 0.3mm, 19 subjects feel no pain except for this subject, whose original pupillogram of 0.6mm is presented here (M1, M2, M3 measurement of right eye for the 1st flash) , which is denoted as 0.6mm-D1. The initial level of pupil's radius (M1: black arrow) is highest among those of M2 and M3. (B):case-2. This subject did not appeal any pain even in 0.6mm. All pupilograms of the case-2 were so constant that the curves were similar to each other.

in length of the needles (0.3mm, 0.6mm) also represented the different patterns of the significant differences (Table 1). These might be due to the different invasion signal, i.e. trans-epidermal or not. The thickness of the epidermis is usually about 0.3mm in depth, therefore the 0.3mm needle-patch do not penetrate into the dermis, but destroying some cells and giving intra-epidermal stimuli without bleeding, while the 0.6mm needle-patch breaks the basement membrane, penetrating into the dermis, giving trans-epidermal stimuli, sometime with a very little bleeding. In the dermis and subcutis, there are various kind of sensory organs, such as Pacinian corpuscles, Meissner's corpuscle, and so on, however, any special structures corresponding to the acupuncture points could not be discovered yet(13). In the case of acupressure, we think that the Pacinian corpuscles might play an important role for the effectiveness, because more than 30 sec pressing to the point is necessary and effective from our clinical experiences for 10 years. Taking the acupuncture point distribution into account, the topologically different signals conveyed to the different part of the sensory cortex via thalamus, which is the switching center of the impulses associating with various feelings, are also important. Furthermore each cell in our body might have the positional value[14] in situ, sensing the surrounding environment, which controls the cell behavior and keeps the cell's differentiation status. Although the mechanisms are too complex to know, every signal to the surface of the body also affects our body function, the general tendency is worthy of referring. These tendencies are thought to be the needle-patch effects. We stick to the pain sensation on this research, therefore we asked each subject about the feeling of the patch. We got an interesting result (Fig. 5). The difference in the feeling between 0.3 and 0.6 mm needles is understandable as indicated in the figure 2C (intra-epidermal or trans-epidermal). The needle stimuli for the case-1 would arouse the homeostatic power of return to regular pupil reaction to the light and the needle removal would release the fearful emotion to make the graph similar to that of the case-2. The case-2 person did not declare any painful feeling. This would indirectly change the curve to the regular pattern. As additional information, in the case-1, the interval between the experiments of 0.3mm and 0.6mm was 6 days, while in the case-2, the interval was 28 days. Admitting the difference condition, we think the difference did not affect the phenomenon.

The heart rate and the radius of the pupil are controlled via autonomic nervous system. The increased RR interval with time and the constriction of the pupil (parameter 01 reduction) are sometimes said to be a resting effect due to the parasympathetic dominant status. As for the power spectrum of the HRV, HF is said to be parasympathetic element, and LF/HF sympathetic one (11). Compared to the placebo, the removal of 0.6 mm needle-patch decreased the TP (=HF+LF+VLF) which includes both elements. This means the removal of the needle-patch accompanied with TP reduction would get a potential power to cope with incoming next stress. We would like to call it a "resetting" effect like computer system becomes healthy by pressing the resetting switch.

It is hard to explain these phenomena with simple balance between sympathetic and parasympathetic. Since the dividing the autonomic nervous system into sympathetic and parasympathetic is man-made and we use it opportunistically, we had better call it just an autonomic function. Though easy to understand and useful, the classification is sometimes confusing and makes it difficult to understand the true status of our system. Anyway our body may take advantage of every system to keep our body healthy, sometimes that is via neuronal, sometimes via hormonal, and others. Nowadays, the energy homeostasis such as metabolic function of the liver is thought to be controlled by autonomic nervous system as well as by hormonal system[15]. In this study, our results successfully demonstrate that the acupuncture signal affects the control of the autonomic function of the heart and the eyes even with a tiny-needle.

Our data suggest that the initial status of individual subjects are very much different from each other, however, the measurement results after the treatment of very tiny needles (M3) showed much smaller significant difference among subjects and there may be due to not only resting effect but also "resetting" effects leading to the difference between treated and non-treated cases (Table 1: RR, TP). Since the "resetting" effect depends on

the various pre-conditional status of the individual, the acupuncture clinical trials were so difficult that the results were sometimes positive and sometimes negative at the clinical levels. Anyway, even slight stimuli affected our body function, which suggests that the turbulence makes our body function return to the normal status or regular pattern of homeostasis like computer systems with reboot. Such slight signal of acupuncture is thought to influence our body as a drug, thus we refer to it as "Info-Medicine" or "Info-Med"[16-17].

A lot of more researches are necessary to elucidate the mechanisms for it to be applied to daily life effectively. We should take advantage of such time-honored remedy combined with modern medicine and the Info-Med. We call it a FPM (full-powered medicine) with "Info-Med" using full IT systems[16-18] in order to overcome the problems of a rapidly aging society. That is challenging and challengeable.

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Disclosure statement

No potential conflicts of interest were disclosed.

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鍼治療の根拠：微弱な刺激が生体機能を変化させ「リセッティング」効果を示唆する

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1972年，ニクソン大統領の訪中後に鍼灸治療は米国でブームになったが，後の科学的研究はその効果を否定し劇場型プラセボ効果と結論づけた．しかし，我々はここに鍼の効果を明確に示し，新しい作用機序として「リセッティング効果」を提案する．鍼灸の実験計画において，コントロールやプラセボの設定は非常に難しく，痛みを伴うので機序解明が複雑になる．そこで，できる限り痛みの要素を除き，鍼の微弱な刺激による影響を観察したところ，微弱な刺激でも生体機能に影響を及ぼしているということが明らかになった．さらに心拍変動のフーリエ変換による周波数分析ではTotal Powerがプラセボと比べ抜鍼後に有意に減弱し，また刺鍼により引き起こされたであろう徐脈とコントロール群における安静効果による徐脈も，同じく抜鍼により減弱した．同様の傾向は，瞳孔に於ける変化においてもみられた．多角的な実験結果から，刺鍼により生体機能の乱れを引き起こし，それが恒常性維持機構を発動させ，その後の抜鍼によるストレス除去が元の初期（健康な）状態に戻す力となっていると考えられる．即ち，この刺激除去が，リセットにより再起動したコンピュ―ターシステムのように初期状態，即ち健康な状態に戻す可能性が示唆され，我々は，鍼の「リッセッティング」効果を提案する．