A BRIEF FORAY INTO PHILOSOPHICAL AND PRACTICAL ISSUES CONCERNING MICRO-CURRENT FREQUENCY STIMULATION AND RELATED MODALITIES

“CONTRARIA SUNT COMPLEMENTA” - Niels Bohr (1885-1962)

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ABSTRACT
While planning exploratory trials in micro-current stimulation, a number of philosophical issues were encountered. This paper briefly explores the philosophical context within which trials in complementary medicine in general may be placed.

The paper embarks on a short discussion of philosophical underpinnings for complementary VS traditional Western medicine, outlines some of the difficulties of evaluating complementary medicine by standards designed for a different system and then proceeds to describe a very basic pilot study into micro-currents applied to the human body.

KEY WORDS
Electro-stimulation, frequency modulated micro-currents, philosophical scientific framework.

1. Introduction

Confronted with illness, pain and discomfort various traditions and approaches to healing have emerged around the world. Each tradition and framework bringing with it different strengths and weaknesses and arising from their own cultural philosophical framework.

However since humans are more than purely scientific, rational, truth-seeking beings, these differences have at times given rise to power struggles for supremacy of one system against another even in the scientific community. Within this context, rational science attempts to unite reason under its banner by upholding the ideals of ‘impartial’ observation (as much as this is practically possible) and iterative testing of theories. It is to this methodology that we now turn to argue for a slight expansion of currently accepted parameters.

At its best, and in order to progress, Science would ideally take special note of observed phenomena which do not fit currently accepted theories [1, 2].

One such phenomenon is the popularity of complementary medicine. Despite increasing popularity and accumulating evidence, the validity and efficacy of complementary medicine, such as Traditional Chinese Medicine (TCM), micro-current stimulation and a range of others, is often questioned according to currently established protocol. This is indeed as it should be, in as much as any new paradigm must inevitably be judged by the currently prevailing ones and of necessity needs to go through a ‘difficult birth’ to prove itself before ‘standing on its own feet’ to in turn impose its rigors on those who would seek to advance current knowledge to its next step. It may be interesting to note, that this process echoes a familiar pattern of leadership and succession struggles in the social/political arena and mirrors the political dimension with its vested interest groups within which all scientific endeavour ultimately sits. Indeed the currently accepted scientific methodology was itself once such a newcomer which once struggled against the prevailing paradigms.

However we are here not arguing for such radical and wide ranging changes. We merely attempt to place into perspective some phenomena which distinguish complementary medicine and which require a different approach. To do so, we briefly consider two rather simplified approaches to medicine and healing and attempt to place them into relationship with each other on a larger conceptual map.

As a first step we postulate a dichotomy of two theoretical endpoints. These endpoints only serve as markers which distinguish complementary medicine and which require a different approach. To do so, we briefly consider two rather simplified approaches to medicine and healing and attempt to place them into relationship with each other on a larger conceptual map.

The first endpoint would be to view the interaction between the patient and the doctor in purely mechanical causal terms, which in its most simplified form places the doctor into the role of a highly trained ‘trouble shooter’ of
an exceedingly complex, largely unknown system. Once the rational cause of a ‘problem’ has been ‘fixed’ the illness is resolved, at least to the limits of current theory. The theoretical endpoint towards which this approach tends is that of radical separation between observer and the observed.

The second endpoint sees the patient and doctor as an intertwined unit, wherein each part of the unit is an essential part of the healing process. In such a connection the mental, emotional state and the intuitive skill of the healer all play a role. Although never practically realizable, the theoretical endpoint towards which this approach tends is one of some kind of connection between the patient and doctor [3, 4].

Western allopathic medicine would be more aligned with the first, ‘harder’ endpoint, whereas complementary medicine is placed further towards the second ‘subjective’ endpoint.

It may be relevant at this point to reiterate that the chosen theoretical endpoints, are purely theoretical constructs which are only modestly approachable in actual practice. Furthermore every approach contains elements of the other to some degree. Thus there is an intuitive subjective, human element in traditional Western medicine, and there is a ‘hard’ procedural algorithmic element in the ‘subjective’ approaches.

Having now established a basic dichotomy of sorts we will outline some possible directions towards resolution. Thus instead of seeing medical paradigms as mutually exclusive opposites, with only one clear winner and only one exclusive ‘truth’ it may be more constructive to adopt a synthesis of the paradigms based on empirical results [5].

A useful precedent of this approach might be the ‘wave Versus particle’ theory of light. Both models of light are indispensable, though neither model covers all observed phenomena. Each model is in itself exclusive of the other in its own domain. However in practice, both models are required to explain the full set of observed behaviours.

The authors suggest that a similar conceptual approach may be usefully applied to the field of complementary medicine. The two theoretical endpoints described above being representative of the complementarity of opposites akin to the ‘particle VS wave’ models of light. Furthermore in as much as the two ‘opposite’ models of light call for a higher level unified theory, so also do the seemingly ‘opposite’ approaches to medicine call for a greater whole that stands above these ‘opposites’ to reveal their deeper unity on a new level.

In principle this pattern of a duality resolving itself in higher level unity, only to then reveal further bifurcations, is a commonly observed fractal pattern from chaos theory [6].

Having established theoretical endpoints and outlined a possible method of resolution between apparent opposites, we now proceed to place complementary modalities on one of these endpoints. To do so we need to establish the claim of ‘differentiation’, that is: to provide evidence for a modality in establishing itself as a new methodology (an endpoint) instead of being merely an aberration in an established paradigm.

1.1 Less is More: ‘power frequency windows’

1) One way for establishing a claim of ‘differentiation’ is to note examples and observed phenomena that do not fit the theoretical framework. We will note just one such example, the existence of ‘power frequency windows’. Applied to living biological systems the phrase refers to the remarkable selective sensitivities of living organisms to certain power and frequency combinations. The logic that: ‘if a strong field has no effect, then a much weaker one will not either’ applies quite reasonably to non living systems of inert matter, but this is not always true once we are dealing with living systems [7-10]. Thus while strong oscillating electromagnetic fields have shown no easily measurable or obvious effects on humans or living systems, much weaker oscillating fields have been shown to affect living systems in often dramatic ways [11]. The exact mechanism of how this is achieved is as yet unknown.

It has been postulated that the living system as a whole contributes the selectivity that is otherwise not present in non-living systems. The phrase ‘power-frequency window’ has been used to describe such phenomena, as applied to living systems [12]. The concept of power-frequency windows may help explain how different systems at radically different field strengths are able to operate relatively independently from each other. Thus systems which would otherwise be ‘saturated’, are able to operate in their own domain [13].

NB: Power frequency windows might also be viewed as an aspect of resonance whereby relatively low level signals are able to ‘tune’ or lock onto each other both on molecular levels and possibly higher level functions [14].

The concept of ‘power frequency windows’ is thought to be an effect of the living system as a whole. It also illustrates a vital difference in approach: while scientific principles established for inert physical matter yield reliable results, this tends to break down as the degree of ‘system wide life’ of the system under investigation increases. This is particularly so as far as meta-systemic effects unique to living beings are concerned. These systemic effects include the ability to maintain internal equilibrium, tissue repair and various sensing functions concerned with survival, not to mention the hard to quantify states of awareness/feeling and consciousness.

To sum up: While living tissue may be treated as inert matter and reliable results obtained to the degree that the absence or presence of life is not pertinent to the measurements, as we progress to organism-wide functions
such as the delicate balance of life functions, health/disease and homeostasis, difficulties are encountered.

2) While hypothesis driven research is considered the ‘norm’, it is may also be sheer data and empirical evidence which drives new directions in science [15]. Thus another way for a newcomer to establish itself is by staking a claim of ‘differentiation’ (and its place as an endpoint on our hypothetical scale), through the sheer number of positive results i.e. through demonstrated success. The popularity of various new forms of complementary medicine is a potent argument that many people are finding relief of a kind despite the often higher financial costs.

2. Electro therapy: background

An example of a relative newcomer in the medical field, is the awareness of electric currents and fields applied to living tissue. Electric currents have been used as a form of therapy since ancient times . In those early days electric shocks were induced by agitating torpedo fish in a bucket. These were applied to the feet of gout patients [16].

The use of electricity in therapy has grown with the development of various electromagnetic technologies [17-19].

2.1 Micro-current Electrical Neuromuscular Stimulation (MENS)

Micro-current Electrical Neuromuscular Stimulation (MENS) devices use extremely low currents. Micro-currents are more similar to the body's own electric currents. It has been suggested that this quality may make MENS especially effective at activating the body's own healing mechanisms without overriding them. MENS has been shown in various trials in the last three decades to significantly accelerate the healing process of wounds, skin ulcers, tendons, bones. More recently MENS has been introduced for treating pain, chronic pain and mood disorders. A wide range of TENS and MENS devices have been developed, some allowing complex frequency and pulse modulation [18, 20-25].

2.2 Frequency Specific Micro-currents (FSM)

Although sometimes confused with Transcutaneous Nerve Stimulation (TENS), Frequency Specific Micro-currents therapy is not the same as TENS. In FSM the current levels are three orders of magnitude lower than in TENS and at very specific frequencies. Treatment results differ and the effective mechanisms while still unclear seems to be different from those of TENS. FSM tends to extend beyond the actual treatment period for which the device was switched on and yield longer term effects [26].

Frequency Specific Micro-current (FSM) treatment is a specialized form of Micro-current Electrical Neuromuscular Simulation [27, 28]. Like MENS, Frequency Specific Micro-current therapy is a modality whereby specific frequencies are used to treat specific conditions, often chronic pain and/or specific tissue types. It is important to note that the specificity of the paired frequency channels is a crucial factor. As the name implies not only are extremely weak currents used in Frequency Specific Micro-current therapy but the exact frequency relative to the condition being treated is said to play a crucial role. Good results in treating Fibromyalgia pain (FMS) have been obtained. McMakin and others have shown that on the cellular level this treatment can substantially reduce pro-inflammatory Cytokines and increase release of Beta endorphin in cases of fibromyalgia triggered by post-cervical trauma [26, 27, 29].

3. Exploratory experiments

Every series of experiments carries within itself the possibility of negative or unexpected results. Whether a series of experiments and trials is worth undertaking, is in the final analysis a judgement call based on available evidence in the literature and the personal judgement of the ‘risk versus benefit’ ratio as perceived by the investigators. The acceptable ‘risk VS benefit’ ratio varies between individuals as it is ultimately a personal judgement.

While ample data attesting to the efficacy of frequency modulated micro-current stimulation exists in the literature the investigators sought to allay their own doubts by carrying out a small number of elementary tests. The frequencies used were derived from a number of sources in the literature [26, 27, 29-31]. However there is no universal agreement on specific frequencies or wave shapes.

The results obtained are a very basic foray into the field of Frequency Specific Micro-current stimulation designed to help the investigators make a decision concerning possible larger exploratory trials. No statistical deductions can be made from the results obtained thus far.

A total of 3 normal healthy volunteer subjects participated in a simple protocol consisting of alternating EEG recordings with stimulation periods. Stimulation was for 5 minutes, using two channels EEG recordings for 1 minute. The stimulator used was a: “Precision Micro™ Transcutaneous Electrical Nerve Stimulator”. Electrodes were applied to the middle of the posterior part of the deltoid muscle and to the medial tarsus part of the foot, the rationale being that it is the uppermost part of the trunk and the lowest part of the feet so as to affect most of the body whilst staying away from the head and avoiding currents crossing the spine.
To illustrate by example: The protocol for the first subject is shown in Table 1 below. The same schema with minor variations, as indicated on the horizontal scale of Figures 2 and 3, was applied for the other two subjects.

<table>
<thead>
<tr>
<th>Steps (EEG recorded)</th>
<th>ChA Hz</th>
<th>ChB Hz</th>
<th>µA min</th>
</tr>
</thead>
<tbody>
<tr>
<td>step 1 EE recorded, placebo stimulation (no current)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>step 2 EE recorded, stimulation</td>
<td>0.5</td>
<td>2</td>
<td>400 5</td>
</tr>
<tr>
<td>step 3 EE recorded, stimulation</td>
<td>2</td>
<td>10</td>
<td>300 5</td>
</tr>
<tr>
<td>step 4 EE recorded, stimulation</td>
<td>10</td>
<td>100</td>
<td>300 5</td>
</tr>
<tr>
<td>step 5 EE recorded, Visualization relaxation</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Step 6 EE recorded</td>
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</tbody>
</table>

Table 1: Experimental protocol and settings for experiment 1.

Figure 1 shows the EEG recordings summarized in four main bands for the first subject. The standard EEG ranges used were: Delta 0.3 – 4Hz, Theta 4 – 8Hz, Alpha 8 -12Hz, low Beta (or beta 1) 12 -15Hz, high Beta 15 – 36Hz. The only change noteworthy is the reduction of the alpha band following stimulation with frequency bands 2Hz and 10Hz.

Figure 2 shows the same type of graph for a second subject. Again only after stimulation with frequency bands 2Hz and 10Hz in step 4, did a slight change in the alpha band become noticeable.

Figure 3 is the last of the trials using differing frequencies on channels A and B. Since the subject in this case was one of the experimenters and too well informed, no placebo stimulation was possible. Again, some change was noticeable after 2Hz and 10Hz stimulation in step 3.

Purely anecdotal material may also be of interest: In conjunction with the above study, a small pilot study was also conducted with one male subject in his forties. The subject felt he required at least 8 hours sleep per night and complained of tiredness during the day because he had only been able to sleep an average of six hours per night.

The subject was given a series of 10 sessions of Cross Cranial micro-current stimulation during his lunch break, using low frequencies (in the range of 0.3 - 0.6 Hz) [17]. The settings were: 100 to 600 Micro-amps for 30 minutes per session, stimulating both earlobes.

The anecdotal results were: The subject reported feeling very relaxed after each of the treatments. In 5 of the 10 sessions the subject fell asleep for 5 - 10 minutes. In all cases where the subject had fallen asleep during stimulation, he reported feeling remarkably refreshed and maintaining increased energy level for the rest of the working day (rating himself as 8 to 10 on a 1 to 10 Visual Analogue Scale (VAS), where 1 would signify ‘no positive change’ and 10 signifies ‘the full benefits of a
good night’s sleep’. In the other 5 sessions in which the subject had not fallen asleep he reported feeling somewhat more refreshed rating the sessions between 2 to 5 on the VAS.

There is a possible link between micro-current stimulation and the subject’s "power nap" (i.e. short but deep sleep). An obvious question arising from such an anecdotal incident is whether similar benefits would occur without micro-currents stimulation by simply resting for 30 minutes in similar conditions.

Naturally such an isolated experience and the results of 3 trials does not allow us to make any pronouncements, but in conjunction with the available literature the authors considered the results obtained sufficient grounds to accept the ‘risk benefit ratio’ and to proceed to more rigorous exploratory trials. Naturally differing interpretations of the results are possible as well. However as a decision making exploratory tool the trials were useful in showing that some connection between micro-current stimulation and EEG responses was possible.

Having said this, it may be pertinent to mention that the interpretation and meaning of EEG recordings as such is subject to debate. What does a shift towards lower frequencies really signify per se, and what do these changes indicate in the context of micro-current stimulation? These questions remain to be addressed and will determine the shape of planned trials.

4. Conclusion

Thus far we have described the rational path taken by the authors to arrive at the point of deciding to conduct further trials in frequency modulated micro-currents. This has entailed placing the field into a philosophically acceptable framework from which results might be interpreted as well as a few simple tests that served the purpose of ‘convincing’ the authors to proceed.

While no definitive conclusions can be drawn from the exploratory tests, considered alongside the abundant claims made for Micro-current stimulation elsewhere in the literature, the authors have come to the personal opinion that further investigation in the form of more rigorous trials could be worthwhile. Naturally any such trials will need to take into account the complications that arise from involving living conscious subjects.

The authors hope that the future trials will reduce the difficulties of the birth of a potentially new treatment modality somewhat.

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References


