

History and Misunderstanding of Body Tremors

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History and Misunderstanding of Body Tremors	2
Abstract	2
The following reflections come from Dr. Steven Porges.	4
Dr. Cassiani Ingoni postulates that:	4
Dr. Robert Scaer postulates that:	4
References	5

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Abstract

Reduction in stress, tension and anxiety is often achieved by the vibration of muscle tissue as demonstrated through research and the subsequent development of machines which control the amplitude and frequency of the vibratory rate. The purpose of this paper is to summarize the history of the therapeutic effects of controlled vibration in muscles, tissue and joints. It is from this research that the technique of evoking neurogenic tremors through a series of controlled exercises suggests that tremoring is not only useful for the body but is also a self-evoked behavior for the purpose of stress reduction of the muscles.

The second half of this paper is a summary from four neurologists who have experienced neurogenic tremors and have hypothesized the possible etiology and purpose these tremors might have on the neuro-physiological pathways in the human person.

One of the difficulties in speaking about the muscular mechanism that is activated in the TRE routine is that current research and its subsequent literature focuses and identifies muscular tremors primarily as a pathological expression of the neurophysiology of the human body. An example of this is an article entitled: *A comprehensive review of tremor*. This article states that:

Although pathologic tremors can be readily observed, the challenge is determining the etiology and the most effective treatment. More than 10 distinct types of tremor, with varying patterns of onset and degrees of progression, have been identified. Although their characteristics have been documented, the underlying disease mechanisms are not well understood, leading to disagreement about how particular tremors are categorized and treated. Another complicating factor can be multiple kinds of tremor in the same patient (Wyne, 2005, p. 43).

Another article that we can glean information from regarding distinct types of tremors is: *Bioinformatic Approaches Used in Modeling Human Tremor*. This article makes a distinction among a variety of tremors that occur in the human body.

Tremor is defined as a rapid back-and-forth movement of a body part. Tremor is one of the most common movement disorders encountered in clinical practice and is readily apparent in most instances..... Tremor occurs both in normal individuals (the so-called physiological tremor) and as a symptom of a disorder, most often of neurological origin (Manto et al., p. 1).

It continues to distinguish the difference between physiological and pathological tremors.

Physiological tremor is driven by a mechanical reflex and a central neurogenic oscillation, which are superimposed on a background of irregular fluctuations in muscle force and limb displacements. The mechanical reflex component is dependent upon the inertial and elastic properties of the body. Pulsatile perturbations occurring in the human body as a result of irregularities in motor unit firings and blood ejection result in damped oscillations.... Pathological Tremor is usually a rhythmic and roughly sinusoidal oscillatory movement.

However, tremor is a non-linear and non-stationary phenomenon which is distinct from other involuntary movement disorders such as chorea, athetosis, ballism, tics and myoclonus by its repetitive and stereotyped feature. The different pathological tremors are grouped according to their frequency, amplitude, topographical distribution and task or position-dependence (Manto et al., p. 1).

Another potential resource from this article is that the authors categorize tremors into three types: “rest tremor, postural tremor and kinetic tremor” (p. 4). It posits that both rest and postural tremors are part of a disease category defined as “post traumatic tremor” (p. 4).

Vibration or shaking of the muscles in humans is not a new concept. Muscle vibration has a long history of research. In the early 1900s Dr. John Harvey Kellogg was among the noted pioneers of *mechanical vibration* with the introduction of the vibrating chair, platform, and bar. These machines were the fore-runners of the current multimillion dollar industry of vibrating back, foot and neck massagers. The first description of the functioning of the *rhythmic neuromuscular stimulation* (RNS) method (the technique that today’s *vibration methodology* is based on) dates back to 1960 when Professor. W. Biermann, from the former East German Republic, described so-called “*cyclical vibrations*” as being capable of improving the condition of the joints (by stretching muscles and tendons) relatively quickly.

The first serious application of vibration on human muscles was utilized by Russian scientist Vladimir Nazarov in the 1970’s. He used *vibrational stimulation* on gymnasts in training for Olympic gold (Issurin & Tenenbaum, 1999). This process was called *vibrational therapy*. It was performed by having athletes stand on platforms or use machines that produced vibration. Numerous studies demonstrated that low-amplitude and low-frequency mechanical stimulation of the neuromuscular system had positive effects on athletic performance (Cardinale & Bosco, 2003; Torvinen et al., 2002; Bosco et al., 1999).

For many years it was primarily used by elite athletes to help increase the strength and coordination of the musculoskeletal and nervous systems and to increase the rate at which athletic injuries heal (Bosco et al., 1999). Russian scientists also utilized this technology to help their cosmonauts combat the degenerative effects of micro gravity. In the late 1990’s Guus van der Meer, Dutch Olympic team trainer – was first to recognize the benefits of vibration in healthy populations, and developed *Power Plate*.

Over time vibrational therapy developed as a serious field of research known as *Biomechanical Stimulation* ([BMS], Bosco et al., 1999). It was then used in physical therapy and rehabilitation programs to correct restricted body mobility, range of motion, the coordination of musculoskeletal and nervous systems and to increase the rate of healing injuries (Bosco, Cardinale, & Tsarpela, 1999; Bosco et al., 2000). BMS research has demonstrated that exposure to vibration frequencies between 20-50Hz increased bone density and they were also helpful in providing pain relief and the healing of tendons and muscles (Bosco et al., 1999).

Biomechanical stimulation has evolved into the most recent form of vibrational therapy known as *whole body vibration* (WBV). Whole body vibration has been recently proposed as an exercise intervention because of its potential for increasing force generating capacity in

the lower limbs (Cardinale & Wakeling, 2005). Kerschman-Schindl et al. (2001) have demonstrated that whole body vibrations can positively alter muscle blood volume. It has also been recognized by many professional athletic trainers that low-frequency vibration used as a training tool appears to increase muscle strength (Torvinen, et al., 2002).

The following reflections come from Dr. Steven Porges.

He suggests that:

there is a “medical” bias to use “tremor” as a clinical symptom. However, there are normal “physiological” tremors in all humans that represent the CNS regulation of the motor pathways.

More specific and relevant to your work, are “isometric” tremors. Isometric tremor occurs when there are voluntary muscle contractions without movement such as pushing against a wall. There is an afferent feedback from muscles to brain during the isometric contraction and the afferent feedback from the muscles to the brain when the [muscular movement] tremor occurs. However, I think how the sensory feedback of the tremor is interpreted is the core of your treatment model. I think it has to do with “accepting” the involuntary (uncontrollable) muscle activity in a context and state of safety. I believe that the “normal” sensory feedback from isometric tremor is telling the brain that the body can no longer protect itself. And, what you are doing is a restructuring of these “helpless” and uncertain body signals (and memories) into a context of safety and predictability.

I think an adaptive strategy would be to educate the reviewers that body tremor at specific frequencies is how the nervous system regulates muscle control. This naturally occurring neurophysiological process is labeled “physiological” tremor to contrast it with pathological tremor. You also need to explain that isometric tremor, a naturally occurring benign tremor, increases the amplitude of physiological tremor and is categorically NOT pathological tremor.

(Personal letter from Stephen Porges who is currently a Professor in the Department of Psychiatry and the Director of the Brain-Body Center in the College of Medicine at the University of Illinois at Chicago and holds appointments in the Departments of Psychology, BioEngineering, and Anatomy and Cell Biology).

Dr. Cassiani Ingoni postulates that:

the muscular movement evoked by the Trauma Releasing Exercises (TRE) act as a very specific training protocol with significant potential of inducing functional long-term changes in neuro-muscular crosstalk: e.g. changes in neurotransmitter receptor properties, density, and distribution at the neuromuscular junction; changes in muscular end-organ receptor signaling; and changes in central and peripheral nervous system processing of proprioceptor information. (Personal letter from Dr. Riccardo Cassiani-Ingoni (Neuroscientist))

Dr. Robert Scaer postulates that:

the muscular movement elicited in the Trauma Releasing Exercises (TRE) seem to be a reflexogenic pattern held in procedural memory. This is evidenced by their ability to be elicited in every human with relative ease. In this regard, they appear to be a natural part of the

genetic composition of the human organism. If researched, it may be discovered that they are a generically based discharge of the human organism.” (Personal letter from Dr. Robert Scaer (Neurologist).

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