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Perspective

Sanomechanics and Floating Skeleton Concept for Learning and Teaching Yoga Therapy

Oleg Galibin*

Pavlov First State St. Petersburg Medical University, Russia

Abstract

Success in Yoga therapy depends on a quality of learning of the exercises' physical technique and its bond with mental concentration. For many people, the mental aspect is more difficult than the physical one if a teacher's instruction does not have a clear visual pattern. At most, rational explanations of the biomechanical meaning and outcomes of a specific exercise are substituted by references to the structures and instances, which cannot be currently measured or scientifically verified and are rather mysterious.

In a search for rational scientific models applicable to Yoga training and therapy, the author found a report on a recent experimental study on transmission of pressure from one joint capsule to the others. The study by Tufts University team demonstrated that the pressure is transmitted hydrostatically via tiny spaces between the surfaces of long bones and periosteum. This discovery points on existence of an unnoticed before subsystem in the skeletal system, which plays an important, if not a key, role in distributing loads applied to the joint cartilages. The subsystem called floating skeleton, can be kept sound with a system of sanomechanics exercises similar to yoga asanas but with a specific criterion of correctness and autosuggestions based on the Floating skeleton concept.

This paper considers an advantage of the reverse application of the Sanomechanics to traditional yoga exercises to facilitate learning by providing rational model of yoga success.

Introduction

Biomechanical concept

Any rehabilitation strategy is a combination of the means and remedies aimed to benefit a patient at most, taken his conditions and the current understanding of the human anatomy and physiology. In a controlled *in vivo* study by the Tufts University group led by Dr. Pitkin [1], it was discovered, that pressure is transmitted between synovial joints. By that, an experimental validation was provided for a floating skeleton concept postulating a hydraulic connection of the synovial capsules covering the joints [2]. Being connected the joint capsules form a hydraulic system allowing for transmitting the pressure of the synovial fluid in one joint to the neighboring joints (Figure 1a). Such a paradigm is in a contrast with a general convention about a joint capsule as an isolated container [3] with in-joint pressure independent of the pressures in the other capsules as illustrated in figure 1b.

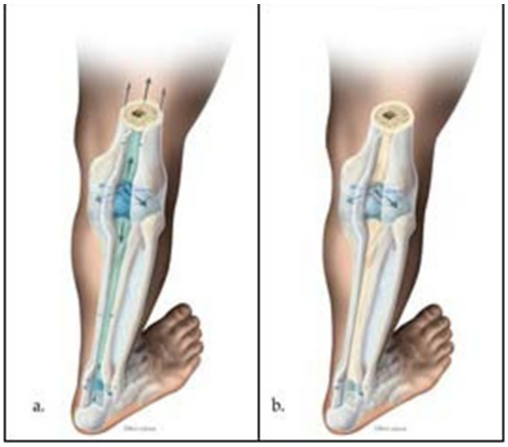

Figure 1a: Artistic illustration of the pressure transmission between joints with the subperiosteal layer of fluid;
b: Traditional representation of synovial capsules that are hydraulically isolated from each other [1].

Biomechanical rationale for hydraulic connection of the joints is a possible reduction of the pressures applied to the contacting surfaces of the bone heads for protecting the cartilages [4].

The concept provides for a new insight to the mechanisms of joint diseases and can be used in development of the new rehabilitation strategies or for enhancing the existing therapies like yoga.

One such technique called sanomechanics was recently introduced by the Dr. Pitkin [5,6]. The exercises in this technique are judged by a unique criterion of correctness according to the signals of encouragements the body generates [7]. According to the floating skeleton concept, the role of encouragement (easing of pain or signal of pleasure) is to indicate that certain postures or movements are beneficial for restoring the hydrostatic connection of synovial capsules with the subperiosteal network illustrated in figure 1a.

Let us consider how the sanomechanics criterion of correctness is established and then how it can be applied to yoga.

Sanomechanics criterion of correctness

Once an adept begins training, the teacher may suggest various criteria of correctness in the exercises. The criteria include, but are not limited by the following instructions:

- Reach a certain posture/angle/point
- Straighten the limb/back/neck
- Move fast/slow
- Load at maximal/minimal/average level
- Make it elegant

***Corresponding author:** Oleg Galibin, Pavlov First State St. Petersburg Medical University, Russia, Tel: +7 8129091608; E-mail: galibino@yahoo.com

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There is one more traditional criterion, which is the closest semantically to the sanomechanics criterion. It is a teacher's recommendation to make it comfortable during performing the required asana of required moves. According to the manual [8], Sanomechanics criterion of correctness of exercising has been developed from the Freud's pleasure principle [9]. While the pleasure principle was pinpointed by Freud to explain transcendental behavior of a person, the Sanomechanics criterion is applied to the performance of exercises to maximize their positive effects and minimize the associated risks. It is also called hedonic (pleasure-related) criterion.

On a surface, make it comfortable and hedonic criteria sound similar, however we see several distinctions between them. The make it comfortable criterion does not specify a level of comfort and duration of the required feedback. It is also does not appeal to the mind of the adept by providing physiological arguments in its support.

In a contrast to that, the hedonic criterion requires to keep the first position of maximal pleasure in a joint (position 1) until the signal is recognized. Then the position has to be changed to the position 2 where the pleasure signal is recognized again, etc.

Graphical introduction to the hedonic criteria is depicted in figure 2, which shows the articulation zones of a typical joint. In zone A, angulation corresponds to the joint's free movement or articulation without significant muscle control. Inside of that zone the major types of ballistic movements occur. Zones B+ and B− correspond to the range of motion during which signal of encouragement (pleasure) is generated. Entering to zones C+ and C− generates the signal of pain, which is a warning about danger for the joint's integrity if the bending continues.

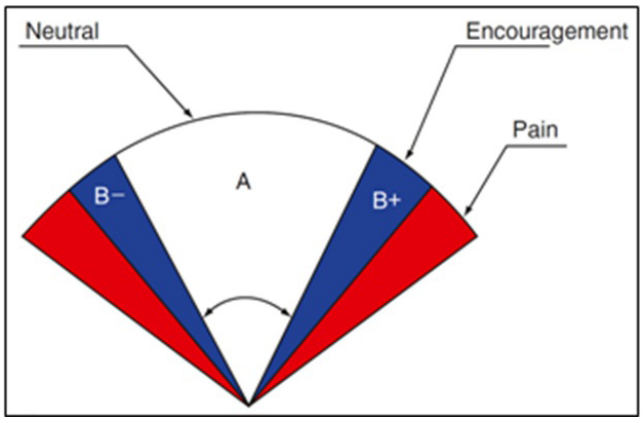

Figure 2: Zones of articulation in a typical joint. A, unrestricted mobility with neutral sensation; B− and B+, zones of restricted mobility with sensation of pleasure; C− and C+, zones of restricted mobility with sensation of pain [5].

In combination with the concept of floating skeleton (figure 1), the hedonic criterion of correctness form the foundation of the structure of sanomechanics.

Structure of sanomechanics

As a method, Sanomechanics is structured as it shown in the figure 3. To make it clear what is a novelty of the method, a black arrow was added with the word "yoga". The arrow connects two blocks: "Conceptual autosuggestion" and "Technique of exercises". These two blocks are central components of yoga as it taught in class. Depending on the school, there are variations in specifics of autosuggestions' context and on methodology of technique.

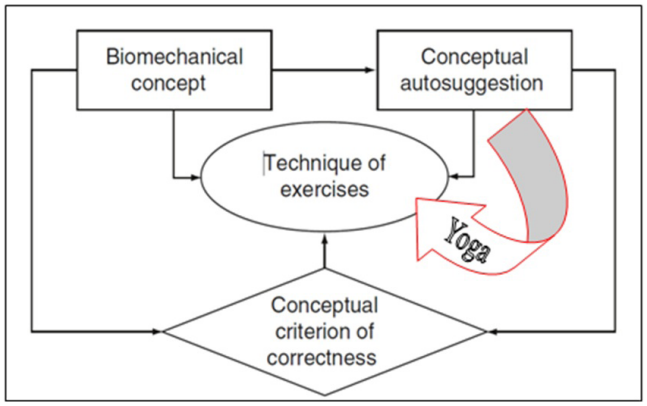

Figure 3: Structure of sanomechanics (modified from [5]).

What is new in sanomechanics, is the "biomechanical (floating skeleton) concept" (figure 1), which has not been presented to adept before. The second novelty is the "conceptual (hedonic) criterion of correctness (figure 2)".

Implications for rehabilitation strategies

The main obstacle in developing more effective treatment solutions for joint impairments is that very little is known: the mechanobiological mechanisms that help joint heads withstand the loads applied to contacting cartilages are not well understood, nor those responsible for initiating distraction in contacting cartilages [10]. The floating skeleton concept (figure 1a) provides for a tentative guidance for development of more scientific approaches to rehabilitation techniques. With only a single experimental validation [1], the concept requires more detailed investigation to create a morphological mapping of the new skeletal subsystem. From that, it could be possible to develop more focused treatment modalities with possible inclusion of pharmacological component.

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