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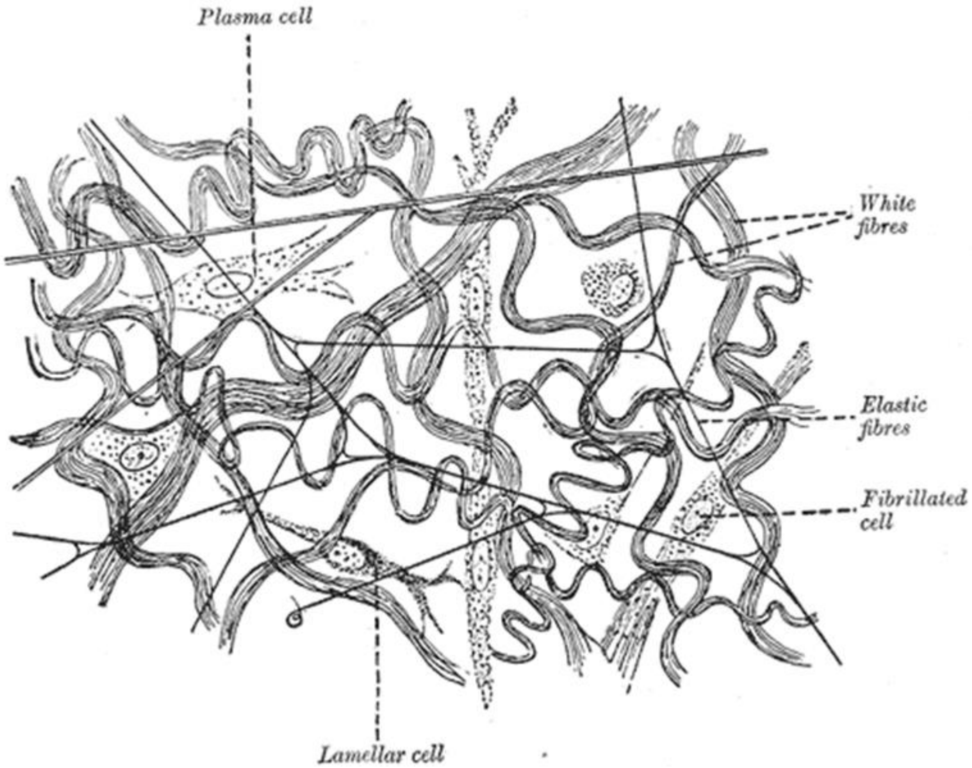
Neuroplasticity between motor and cognitive performance

Prof. Hamdy Abd El-Maksoud El-Gazzar(1)

(1) Prof. at Faculty of Sport Education, Alexandria University Department of Training Combat and Individual Sports

Introduction:
Elastic fibers are essential extracellular matrix macromolecules comprising an elastin core surrounded by a mantle of fibrillin-rich microfibrils. They endow connective tissues such as blood vessels, lungs and skin with the critical properties of elasticity and resilience. Elastic fibers are found in the skin, lungs, arteries, veins, connective tissue proper, elastic cartilage, periodontal ligament, fetal tissue and other tissues which must undergo mechanical stretching. In the lung there are thick and thin elastic fibers.

Figure (1). Elastic Fiber



What is elasticity in exercise? Being "elastic" or "reactive" refers to being able to have a good ability to quickly develop force and transfer one movement's energy into another. The reactive strength index (RSI) is one of the most used field tests for assessing these qualities [11] [13].

What is elastic strength? Elastic strength (power) is the ability to overcome resistance with a high speed of contraction. This can be seen in explosive events such as sprinting, throwing and hitting, where a high percentage of fast glycolytic fibers are needed for a good performance [15] [19] [22].

Training Elasticity (Reactivity):
Being "elastic" or "reactive" refers to being able to have a good ability to quickly develop force and transfer one movement's energy into another. The reactive strength

index (RSI) is one of the most commonly used field tests for assessing these qualities.

The RSI is the jump height of the movement divided by ground contact time. In other words, the higher you jump and the faster you get off the ground the better your RSI will be [14] [15] [21].

Several studies in the field of neuroplasticity research provide strong evidence of a positive correlation between motor and cognitive performance and the density and volume of gray matter [2] [8],]9] ([12] while only a few studies report the inverse relationship, that is, a better performance associated with lower volumes of gray matter [7] [10] [16] [17].

Several important aspects related to dance have been addressed in the literature, one of which is represented by the fact that, through structural magnetic resonance imaging, it has been seen that sensory, motor, and cognitive training modulates brain morphology. Studies on physiological and structural brain functioning in expert and beginner dancers have revealed substantial differences. It has been seen that the increase in speed and accuracy of the typical performance of expert dancers are associated with changes in the primary motor cortex, in the form of an increase in the number of synapses per neuron in the fifth layer of M1 [9] [13].

The differences found between experts and beginners are unequivocally the product of training; the greatest competence is associated with increases in grey matter in some areas. This structural growth reflects an increase in cell size, the growth of new neurons or glial cells, or perhaps even an increase in the density of the spine, but seems to reverse when practice ends, although performance remains at high levels. In addition, experts compared to beginners seem to show "neural efficiency", the trend towards greater distinct neural activation. However, there is an ongoing debate on the direction of observed effect [10] [11] [13] [20]. To date, however, there is a tendency to consider these alterations as the result of assiduous practice [2] [3] [4] [16].

In addition to plasticity in dancers, the correlations between plasticity and motor learning in other sports have also been investigated. Park et al. went on to investigate this process in basketball players, confirming a variation in the volume of grey matter in different cortical and cerebellar areas [18]. A further study confirms this variation in golf players ([13] compared to controls that do not practice sports [3] [6] [10] [16].

Moreover, a study of Magneto encephalography was able to observe neuroplasticity phenomena in people who practice meditation, compared to people who have never practiced meditation and other forms of physical activity [13]. This brief review provides a theoretical framework of the mechanisms underlying motor learning and the resulting neuronal plasticity phenomena. Particular attention has been paid to the role of physical activity, which contributes significantly to improving the state of health of the brain, inducing neuroplasticity phenomena through the learning of motor sequences. Exercise through the experience of movement would be able to create favorable conditions for an adaptation of brain structures to external stimuli. Physical activity induces psychophysical changes, such as vascular and neuronal changes that are decisive for an improvement in attention, memory, and mood. The positive impact of sport on neuronal flexibility phenomena highlights the importance of these practices at all age levels both in physiological and pathological conditions, for the improvement of the quality of life [1] [4] [5].

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