

Body Image and Muscle Tonus: from Paul Schilder to current days

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Introduction

Muscle tonus is seen as the minimum muscle resistance against stretching. The miotatic reflex, also a monosynaptic reflex, is considered its functional support (Kandel, Schwartz and Jessell, 2000). Body Image can be defined as the mental representation of body Identity. It is structured and influenced by physiological, psychological, social and cultural aspects (Tavares, 2003). Following neurological knowledge at his time, Paul Schilder pointed out the influence of muscle tonus on the formation and development of body image. He stated that Body image leans toward muscle tonus and that an action on any part of the body results in an action on the whole body (Schilder, 1999). Neuroscience discoveries about the neural network plasticity related to human behavior links Schilder's concepts about Body Image to current days. Thus, the purpose of this study is to reflect upon the inner relation between Muscle Tonus and Body Image discussing Paul Schilder's considerations under current neuroscience knowledge.

Methodology

This bibliographic study has two steps: 1. Paul Schilder's Considerations. 2. Reflections under current neuroscience knowledge.

1.1 Paul Schilder's Considerations

Basing his studies on theories developed by Henry Head and other neurologists of his time, Paul Schilder is a milestone in Body Image research. Graduated in Neurology, Psychiatry and Philosophy, he added the physiological, psychological and social aspects to the research and expanded Body Image

studies beyond neurology. Schilder highlights the importance of body sensations based on the Postural Model described by Head as the Tridimensional Image we make of our own bodies. Our identity is built upon life experiences. Hence, Body Image is characterized as a mental representation of body identity (Campana e Tavares, 2009). The development of body image involves not only tactile, thermal and pain impressions, but also those originated from muscles and their connective tissues, tendons, muscle innervations and internal organs. The body adopts a new posture or movement registered in a plastic way, after going through a sensorial experience of the world and the self. This allows cortical activity to create a connection with each new group of sensations detected after postural changes. Then, a new representation appears (Schilder, 1999). Since the sensorial processes that influence the body postural model interact directly with its motility, Schilder's studies highlight the relation between muscle tonus and body image. Joining Hoff and other researchers of his time such as Eidelberg and Selling, he examined a phenomenon, which he named "Tonus Persistence Phenomenon", as a muscle tension created to restore a previous body posture whose effect might remain unconscious. This phenomenon spreads out through the whole body. Each movement modifies the muscle tension of other body parts and, consequently, makes the postural model dependent on muscle tension (muscle tonus). From neurophysiologic grounds, Schilder takes the concept of Body Image to other areas such as psychology and sociology, emphasizing that body image building is given by one's relationships with oneself and with the environment. That is, according to social and cultural experiences, internal impressions and sensations, beliefs and values, the subject reacts bodily through tension changes and, consequently, welcomes new experiences which might come as a result of the relation between the internal and external environment. Therefore, the man is able to express his subjectivity and develop as a single and social being using his movement and the basic unit of movement is based on muscle tonus modulation. He also noticed that subjects with no neurological damages showed some alterations in the way they see and sense their own body. That is, body perception is linked both to structural aspects as well as to the subjective way of perception (Schilder, 1999).

1.1 Reflections under current neuroscience knowledge

Muscle Tonus can be considered as muscle resistance force against stretching. Its function is to keep posture and perform ongoing movements. This happens due to the elastic properties of the muscle reinforced by the tonus neural component. The afferent fibers Ia and II in the central region of the muscle sensitive organ (muscle spindle) sends the information to the efferent fiber alpha in the spinal cord which acts on the extrafusal muscle fibers causing the muscle to either contract or relax as a whole. (Kandel, Schwartz and Jessel, 2000). These muscle spindles, however, show their own efferent innervations through the gamma system. This system represents the static and dynamic gamma motor fibers which regularly act on the polar regions of the intrafusal muscle fibers, keeping the muscle spindle constantly active. The smallest change in the activity of such a system can change the length and the tension of the spindle fibers which are sensed by the afferent fibers. The latter then send information about the status of the spindle fibers to the motor neuron causing an action which triggers the transmission process of the circuit. This mechanism is also directly affected by the suprasegmental regions which interfere with posture maintenance and movement performance. The fact that the suprasegmental control is intrinsically connected with brain functions such as memory, emotions and motivation which act on the muscle spindle should be taken into consideration. Muscle spindles run parallel to the muscular venter fibers, so they are specifically reactive to changes in muscle length (Cohen, 2001). Since motor control becomes inefficient without sensorial feedback, the motor and sensorial systems are therefore closely integrated entities. Besides, activities such as motor control and motivation are always preceded and moulded by the sensorial cortex (Adams, Victor and Ropper, 1997). Le Boulch (1982) states that this close correlation is the basis of topographically organized representations and the source of mental images. First, the person is essentially emotional, driven by the fulfillment of needs through tonic-postural reactions. That is, intentional motor experience develops from the tonic-emotional experience. Thus the movement becomes a way to figure out the unit through the experience lived by one's own body. When cortical maturity and discrimination of psychic occurrences happen, the needs become desires,

justifying the intentional aspect of postural adjustment. The intention associated to motivation gives meaning to the gesture (Damásio, 1996, Spitz, 1998). Therefore, tonus is more than a somato-sensorial expression. Since it is dynamic, it updates the images of the individual's body identity. The movement shaped by the muscle tonus creates a successive internal structure which can project the person to new experiences. Thus the movement becomes the most meaningful manifestation of human subjectivity (Fonseca, 1988). Therefore, we change our perceptions at each movement and by doing so we alter our motor responses every moment as well. New mental representations are built and translated into images, which constantly change, and that delineates the dynamic aspect of Body Image.

Conclusion

After contextualizing Paul Schilder's considerations in current neuroscience, it's possible to reach the conclusion that Muscle Tonus and Body Image are closely linked. According to this perspective, Muscle Tonus can be considered as the expression of Body Identity, which adapts to a wide range of physiological, psychological, social and cultural dimensions in a way that is both subjective and dynamic.

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