# Fascia and the Haptic Perceptual System

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BACKGROUND For any given animal, tissue deformation by mechanical disturbances informs about the body, attachments to the body, and surfaces and substances contacted by the body. The information conveyed by these deformations of tissue is detected by the haptic perceptual system (*touch* in its broadest sense; [2]). Historically it has stood apart from other perceptual systems by having no defined medium—no articulated functional equivalent to air and water. For example, a key ecological requirement of a medium for hearing is that information about a mechanical event be available at any arbitrary location, in any arbitrary direction, and at any arbitrary distance relative to the event within the limits of propagation and the attenuating effects of degree and density of absorbing materials. Continua of water and air fulfill this requirement by virtue of their symmetries. If a medium is to be defined for the haptic perceptual system, it will have to be in terms of a continuum description of the body that is homogeneous and isotropic [4].

APPROACH A necessary step in identifying the haptic system's medium is the incorporation of connective tissue on a par with muscular and skeletal tissue [4]: The body is a *muscular-connective tissue-skeletal (MCS) system* (not simply a muscular-skeletal system). Key to this MCS conception is evidence of mechanoreceptor alignment with fascia (e.g., [5]). If the MCS system is homogeneous and isotropic in sufficient degree then haptic perception capabilities should be essentially the same across all body sites. In respect to the haptic subsystem of dynamic (effortful) touch, nonvisual perception of property y of object x should be the same whether x is grasped by hand and wielded (rotated, shaken, etc.) about the wrist or attached to the shoulders and wielded about the hips.

RESULTS AND CONCLUSIONS A large body of data accumulated on dynamic (effortful) touch over the past several decades [1, 3] is consistent with the hypothesis of a body-wide MCS system as medium. Here are four examples. (i) The lengths of hand-wielded rods are perceptible despite complete neuropathy (stereognosis test score of zero) of the wielding arm. (ii) Perception of rod lengths is the same for wielding freely about wrist, about elbow, about shoulder. (iii) For rods "held" somewhere along their lengths and wielded, whole lengths and partial lengths (say, rightward of "holding" location) are perceived with equal accuracy for "holding" by hand, foot, or shoulders. (iv) Perception of rod lengths is the same for rods held stationary with one hand, or propped by two hands, the hand and a knee, or the hand and an environmental support. In short, it is argued that the MCS system as medium is deformed lawfully by dynamically touched objects, allowing perception of those objects by any part of the body that extracts invariants from the medium.

REFERENCES [1] Carello C, Turvey MT. Dynamic (Effortful) Touch. Scholarpedia, 2015. [2] Gibson JJ. The senses considered as perceptual systems. Houghton-Mifflin, Boston MA, 1966. [3] Turvey MT, Carello C. Dynamic Touch. In Epstein W, Rogers S, Eds. Handbook of perception and cognition, Vol. V. Perception of space and motion (pp. 401-490). San Diego: Academic Press. 1995. [4] Turvey MT, Fonseca ST. The medium of haptic perception: A tensegrity hypothesis. J Mot Behav 46: 143-187, 2014 [5] Wal JC. The organization of the substrate of proprioception in the elbow region of the rat. Doctoral Dissertation, Maastricht University, Maastricht, The Netherlands, 1988.