

## ***“Muscle Synergies Without a Brain or Spinal Cord”***

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### **ABSTRACT:**

Even motor actions that appear simple, like turning a key, require a surprisingly accurate balance of forces among a large number of finger muscles. Three decades of work on multi-muscle coordination claims to have identified the existence of neural circuitry responsible for grouping muscles together (forming muscle synergies) to facilitate achieving the required balance. Here we show that human finger muscles are likely not grouped into synergies, but rather, are activated flexibly in accordance with their mechanical action. We go on to show that muscle synergies appear in our laboratory using a computer-controlled cadaver finger, arising from purely biomechanical constraints. We conclude that muscle synergies could arise from the geometry of the body just as easily as they could arise from neural circuitry; thus, muscle synergies without a brain or spinal cord.