Life Science Research - Biomechanics; Research Conducted at University of Southern California Has Updated Our Knowledge about Biomechanics (Similar movements are associated with drastically different muscle contraction velocities)

Publication info: Life Science Weekly ; Atlanta (Aug 15, 2017): 3448.

FULL TEXT

2017 AUG 15 (NewsRx) -- By a News Reporter-Staff News Editor at Life Science Weekly -- Investigators publish new report on Life Science Research - Biomechanics. According to news reporting originating from Los Angeles, California, by NewsRx correspondents, research stated, "We investigated how kinematic redundancy interacts with the neurophysiological control mechanisms required for smooth and accurate, rapid limb movements. Biomechanically speaking, tendon excursions are over-determined because the rotation of few joints determines the lengths and velocities of many muscles."

Our news editors obtained a quote from the research from the University of Southern California, "But how different are the muscle velocity profiles induced by various, equally valid hand trajectories? We used an 18-muscle sagittal-plane arm model to calculate 100,000 feasible shoulder, elbow, and wrist joint rotations that produced valid basketball free throws with different hand trajectories, but identical initial and final hand positions and velocities. We found large differences in the eccentric and concentric muscle velocity profiles across many trajectories; even among similar trajectories. These differences have important consequences to their neural control because each trajectory will require unique, time-sensitive reflex modulation strategies. As Sherrington mentioned a century ago, failure to appropriately silence the stretch reflex of any one eccentrically contracting muscle will disrupt movement. Thus, trajectories that produce faster or more variable eccentric contractions will require more precise timing of reflex modulation across motoneuron pools; resulting in higher sensitivity to time delays, muscle mechanics, excitation/contraction dynamics, noise, errors and perturbations. By combining fundamental concepts of biomechanics and neuroscience, we propose that kinematic and muscle redundancy are, in fact, severely limited by the need to regulate reflex mechanisms in a task-specific and time-critical way."

According to the news editors, the research concluded: "This in turn has important consequences to the learning and execution of accurate, smooth and repeatable movements and to the rehabilitation of everyday limb movements in developmental and neurological conditions, and stroke."

For more information on this research see: Similar movements are associated with drastically different muscle contraction velocities. *Journal of Biomechanics*, 2017;59():90-100. *Journal of Biomechanics* can be contacted at: Elsevier Sci Ltd, The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, Oxon, England. (Elsevier - www.elsevier.com; Journal of Biomechanics - www.journals.elsevier.com/journal-of-biomechanics/)

The news editors report that additional information may be obtained by contacting F.J. Valero-Cuevas, Univ Southern Calif, Div Biokinesiol &Phys Therapy, Los Angeles, CA, United States.

Keywords for this news article include: Los Angeles, California, United States, North and Central America, Biomechanics, Life Science Research, University of Southern California.

DETAILS

Subject:	Kinematics; Biomechanics; Life sciences; Muscle contraction
Location:	California Los Angeles California United States--US
Identifier / keyword:	Los Angeles California United States North and Central America Biomechanics Life Science Research
Publication title:	Life Science Weekly; Atlanta
First page:	3448
Publication year:	2017
Publication date:	Aug 15, 2017
Publisher:	NewsRx
Place of publication:	Atlanta
Country of publication:	United States
Publication subject:	Medical Sciences
ISSN:	15522466
Source type:	Trade Journals
Language of publication:	English
Document type:	News
ProQuest document ID:	1927592789
Document URL:	http://libproxy.usc.edu/login?url=https://search.proquest.com/docview/1927592789?accountid=14749
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Last updated:	2017-08-10
Database:	ProQuest Central

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