Clinical and engineering expertise are combined for better understanding and treatment of back pain

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(Medical Xpress)—Nearly eight in 10 people experience back pain at some point in their lives. Daily life, job conditions, recreational activities, and simple aging have left most of us unfortunately acquainted with some sort of back pain, ranging anywhere from acute and temporary to chronic and disabling.

In other words, nearly everybody's back hurts, and that's a real problem: The latest Global Burden of Disease Study (2012) ranked low back pain as the leading cause of disability globally, ahead of more than 200 other conditions. Predictably, the related economic impact is immense. According to the National Institutes of Health, low back pain is the most common cause of job-related disability and a leading contributor to missed work in the U.S., where Americans spend at least $50 billion each year on back pain.

Despite the ubiquitous nature of back pain and increasingly advanced understanding of the structure of the back, the exact causes of back pain remain largely unclear, and it's equally mysterious why some people respond favorably to certain treatments—like chiropractic manipulation, medicine, or exercise—while others do not.

The reality is that back pain is multifactorial, and only 5 percent of low back pain cases are diagnosed with significant findings of a surgical nature on imaging like x-rays or MRIs. This means that if you have ever

sought treatment for back pain, you've likely experienced the four- to 16-week treatment timeline involving general practitioner visits, muscle relaxers and/or pain meds, maybe some physical therapy, perhaps a pain, rehabilitation, or spinal specialist. After all that, your back pain might or might not be resolved for the majority of patients, the pain improves with time—and in either case, the cause the pain is probably still unknown.

"Standard practice just isn't getting to the cause of it, and there's an unnecessary protraction of getting the right care," said Dr. Arthur Nitz, professor of physical therapy in the UK College of Health Sciences.

His 30 years of treating back pain in the clinic have lead Nitz to team up with Dr. Babak Bazrgari, a biomedical engineering professor at UK who specializes in the mechanics of the lower back. Together they are working towards a better understanding of the back's mechanical environment in order to generate more accurate knowledge of the specific, biomechanical causes of back pain. They hope to translate this knowledge into improved diagnosis, classification, and treatment of back pain in order to minimize the impact of its often uncertain nature.

"We would see a lot of benefits if we could get a more accurate understanding of what's behind garden variety back pain," said Nitz.

Over the past three years, Bazrgari and Nitz have combined their clinical and engineering expertise in several studies that seek to illuminate the mechanical properties of back pain and appropriate treatments.

"If you want to correct some biomechanical problem, you need a good picture of the mechanical environment and an understanding of the consequence of a biomechanical intervention, "said Bazrgari.

Using specially designed equipment, they measure a number of

mechanical variables including force, motion, reaction times and muscle activity. Computer modeling based on biomechanical calculations then reveals exactly what force is being experienced by any element in the lower back (including muscle, ligaments or discs) when a person is performing a given activity.

"As an engineer, I'm trying to provide tools and give information about the biomechanics of the lower back," Bazrgari said. "Clinicians and ergonomists have to find out what to do with these differences."

By determining the specifics parts of the lower back that have abnormal mechanical behavior and could potentially be causing the pain, clinicians will have a better decision-making platform to determine if a patient will respond to a certain treatment.

Nitz, a practicing clinician, hopes that the knowledge they gain about the biomechanical causes of back pack can be translated into simple applications for clinic settings that will more easily predict what treatments patients will respond to.

He and Bazrgari see their interdisciplinary collaboration as natural and necessary in the campaign to truly understand and address back pain.

"Biomedical engineering is something that physical therapists aren't really qualified to do," said Nitz. "In trying to answer questions about back pain, Dr. Bazrgari needs some portal for seeing patients, and physical therapists need his expertise so we can understand the biomechanical properties of what's actually occurring in our patients. It's a pretty natural symbiotic relationship."

As is often the case, collaborating across disciplines has required both researchers to expand their professional vocabularies.

"It's been a really great learning experience for me because it takes time to learn the way clinicians use terms and vice versa," said Bazrgari.

The obvious potential for collaboration was something that attracted Bazrgari to join UK's faculty three years ago.

"Coming here, I was excited about the collaboration possibilities. With the colleges like public health, medicine, nursing, and health sciences on a single campus, there are unique opportunities," he said. "I'm very optimistic that through these collaborations we can do a lot related to addressing back pain."

In addition to the hospitable climate for collaboration, their research has also been supported by the Center for Clinical and Translational Science (CCTS), which has assisted with participant recruitment and identification of other collaborators. CCTS also awarded Bazrgari a small grant to purchase software for a research collaboration with Walter Reed Hospital to study back pain in military service members who have experienced a lower-extremity amputation.

Closer to home, the Commonwealth has many industries like mining, manufacturing and agriculture that are considered high risk for back pain, and Nitz and Bazrgari hope that their work can contribute to real improvements in the health of Kentuckians.

"This problem won't always be a black hole," said Nitz. "We're attempting to do something about it by getting involved in research at every level—baseline and clinical—to make a good faith effort to respond to the needs of the Commonwealth. And the needs of human life."

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